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Two Examples of Foundry Cost Accounting

Methods Devised by New England Jobbing Foundries to Collect and Record Cost Data —Use of Constants or Factors in Estimating

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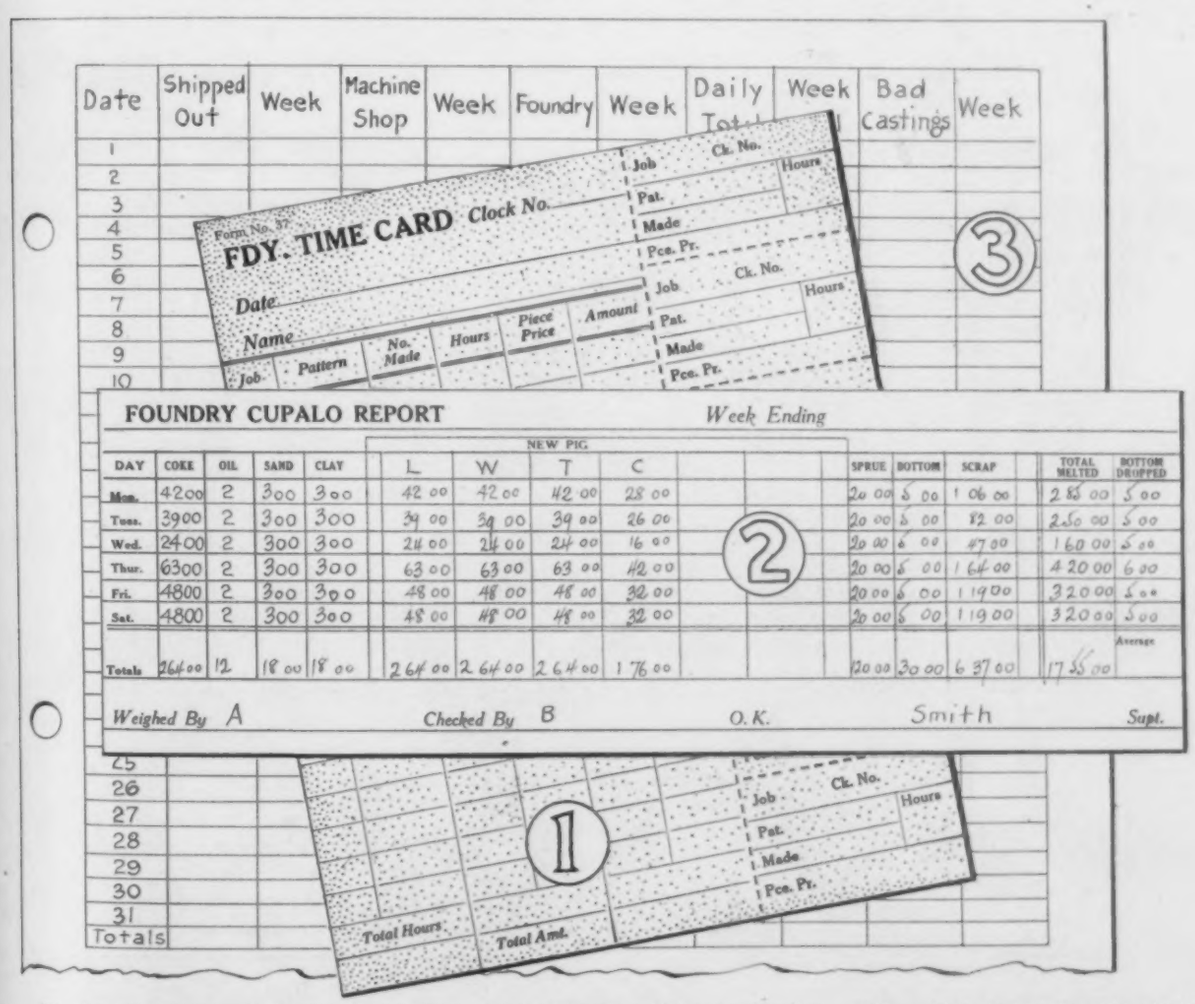
THE subject of foundry costs is a perennial topic in foundry circles. There is no question that indefinite and incomplete knowledge of costs is at the root of many of the evils which have been long and widely accepted as a part of the foundry business; even truer is it that this lack of knowledge of costs is the underlying cause of the high mortality characteristic among jobbing foundries. It is productive of the guess-work estimate—that factor most obstructive to securing the manufacture of castings on the profitable basis, as has been well recognized in machinery work by the machine-tool builders to their advantage.

Some founders, though, have taken long strides


Date
Shipped Out
Week
Machine Shop
Week
Foundry
Week
Daily Total
Week
Bad Castings
Week
Totals
FDY. TIME CARD
Clock No.
Date
Name
Job
Pattern
No. Made
Hours
Piece Price
Amount
Job
Ck. No.
Hours
Pat.
Made
Pce. Pr.
3
FOUNDRY CUPALO REPORT
Week Ending
NEW PIG
DAY
COKE
OIL
SAND
CLAY
L
W
T
C
SPRUE
BOTTOM
SCRAP
TOTAL MELTED
BOTTOM DROPPED
Mon. 4200 2 300 300 42 00 42 00 42 00 28 00 20 00 5 00 1 06 00 2 85 00 5 00
Tues. 3900 2 300 300 39 00 39 00 39 00 26 00 20 00 5 00 82 00 2 50 00 5 00
Wed. 2400 2 300 300 24 00 24 00 24 00 16 00 20 00 6 00 47 00 1 60 00 5 00
Thur. 6300 2 300 300 63 00 63 00 63 00 42 00 20 00 6 00 1 64 00 4 20 00 6 00
Fri. 4800 2 300 300 48 00 48 00 48 00 32 00 20 00 6 00 1 19 00 3 20 00 5 00
Sat. 4800 2 300 300 48 00 48 00 48 00 32 00 20 00 6 00 1 19 00 3 20 00 5 00
Totals 26400 12 1800 1800 264 00 264 00 264 00 176 00 120 00 30 00 6 37 00 17 55 00
Average
Weighed By A
Checked By B
O.K.
Smith
Supt.
2
Total Hours
Total Amt.
1

The foundry weight record, Fig. 3, is a simple form with self-explanatory headings under which are segregated all the items constituting the tonnage record for the month.

The foundry time card, Fig. 1, is made out daily by a foundry clerk. The quickly detachable job coupons aid in the compilation of payroll distribution. The perforations give six such coupons. They are sorted weekly and grouped as far as possible so that a single entry on the payroll distribution sheet frequently comprises several jobs on the same job number.

The foundry cupola report, Fig. 2, is notable for its conciseness and small size. Each variety of pig iron has a separate column. In actual practice these are of course designated by their trade names.

SOME OF THE FORMS USED IN THE TAYLOR & FENN PLANT

Foundry Report, July 1916

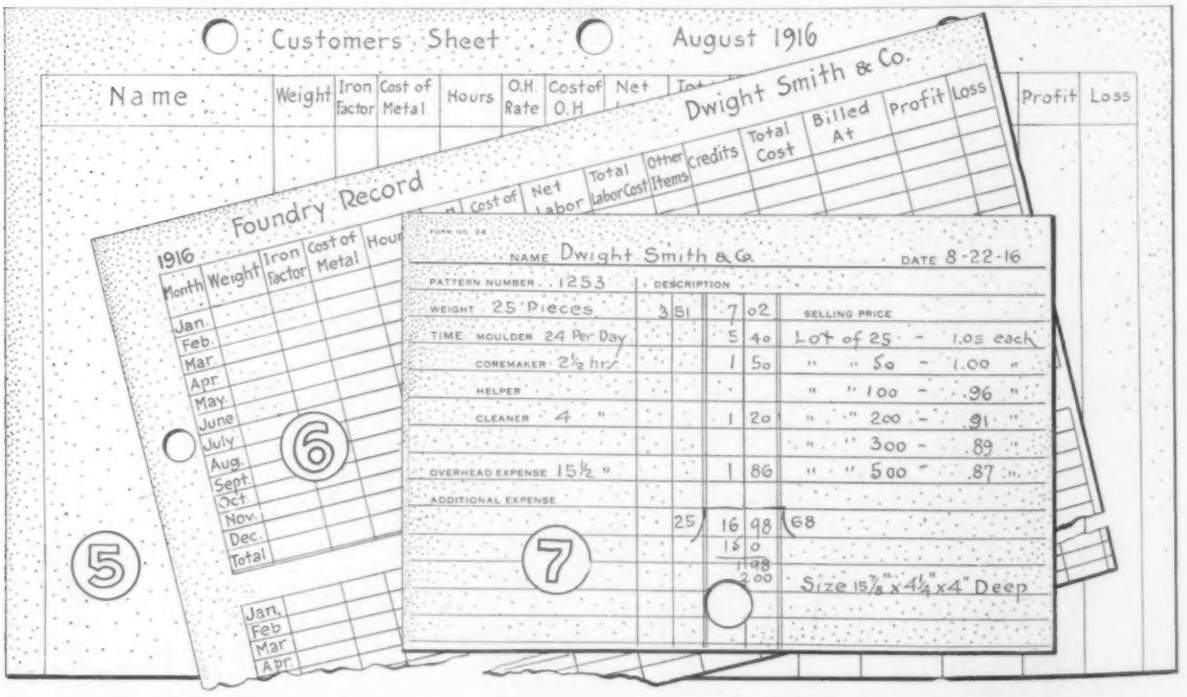
	CHARGE COST	EXP. LABOR	METAL O.H.	COST OF METAL MELTED	DISTR. LABOR	LABOR O.H.	TOTAL LABOR COST	TOTAL COST	SHIPPED	SALES
X-1										
PRODUCTIVE										
FUEL										
IRON										
SAND & CLAY										
607-F										
L.P. & H.										
MLDG. SAND										
GEN. O.H.										
MCH. SHOP										
CUSTOMER										
FOUNDRY										
M.S. PATTERNS										
CUST. PATTERNS								Red		Red
CREDITS										
OTHER ITEMS										
TOTALS										

IRON FACTOR		GOOD CASTINGS		%
HOURLY O.H. RATE		DEFECTIVE "	
DISTR. HOURS ON CASTINGS		SHRINKAGE	
" " " M.S. PATTERNS			
" " " CUST. "			
EXP. LABOR CASTINGS		TOTAL MELTED		100
TOTAL			

AVERAGE TOTAL COST PER LB.	
" SALES PRICE TO CUST. PER LB.	
" " " " M.S.& " " "	
" PROFIT PER LB.	
NUMBER OF PRODUCERS	
" " WORKING DAYS	

Fig. 4—The Taylor & Fenn system has a summary sheet upon which the items are gathered that make it possible to determine an iron factor, so-called, and an hourly overhead rate. The iron factor is obtained by dividing the cost of metal melted by the number of pounds of castings shipped; the hourly overhead rate by dividing the labor overhead by the total of distributive (direct labor) hours. The straight lines in the various columns indicate the positions of the entries on the original form. Customers' patterns have red ink entries and are not included in the totals as the labor has already appeared as part of the total cost of "productive" and the sales as a part of "customers' sales." The red ink entries are made only for the purpose of making monthly comparisons.

toward accurate knowledge of costs and the consequent elimination of unprofitable contracts. One such concern is the Taylor & Fenn Company, Hartford, Conn., whose foundry department is devoted largely to jobbing work. The cost system in this plant is the result of years of study and simplification. It has been in use long enough so that its comparative accuracy has been thoroughly demonstrated



The record of each job takes one horizontal line on the customers' record sheet, Fig. 5. The iron factor and hourly overhead rate employed to obtain the cost of metal and cost of hourly overhead are obtained from the foundry report, Fig. 4.

All the items of an individual customer appearing on the customers' record sheet, Fig. 5, are segregated and appear as a single monthly item in that customer's division of the foundry record, Fig. 6. The vertical columns on these sheets are identical. Each sheet of the foundry record is ruled to show a customer's profit and loss record for six successive years.

The same card, Fig. 7, is employed for both estimates and file cost record card in the Taylor & Fenn plant. The form shown is an estimate. The figures are necessarily fictitious. The actual weight of 25 pieces is multiplied by an iron factor of 2 cents to secure cost of metal melted. The total direct labor of 15½ hr. is multiplied by an hourly overhead rate of 12 cents to obtain the total labor burden cost.

through the general ledgers. In the following paragraphs an effort will be made to bring out the leading features of this system and some of the minor details.

The Taylor & Fenn System

A regular clock time card is employed to register the hours worked by each employee. A foundry time card is made out by a clerk in the foundry office. This card, Fig. 1, is perforated on one edge to form six small coupons, each coupon showing the job number, clock number, hours, pattern, pieces made and piece price. The body of the card bears the clock number, date and employee's name, and has vertical columns for the same information as furnished by the coupons with an additional column for the amount earned on each job. One of these cards is made out each day for each workman and they are checked against the clock time cards. The individual job coupons are sorted each week and entered on a sheet called "distribution of foundry payroll," groups of similar coupons being combined into a single entry. This distribution sheet has vertical columns bearing the headings: Date, charge to, clock number, time, rate, and amount. As all the accounts are known by number or symbol, these columns are narrow and it is possible to put two sets on each sheet. The total of hours on this sheet must agree with the total of the time clock cards, any variation of more than one-half hour being sought for until the cause for variation is found and corrected. The total of the amount columns on these sheets must agree with the total labor payroll.

IRON FOUNDRY COST SHEET

	Weight	Amount	Floor	Bench
Pig Iron				
Scrap Iron				
Steel				
Sprue				
Gross Melt				
Bad Castings made				
Natural Scrap Gates & Sprue				
Total Returns from Melt				
Net Melt				
Goods Castings produced for month				
" " " " period six months				
Average per Lb.				
Productive Molding Labor for month				
" " " " period six months				
" " Molds " month				
" " " " period six months				
Average per Hr.				
" Core Labor " month				
" " period six months				
" " Hours " month				
" " " " period six months				
Average per Hr.				
Total Hourly Burden " month				
" " " " six months				
Constant				
Total Tonnage Burden " month				
" " " " six months				
Constant				
Total Core Shop Expense " month				
" " " " six months				
Constant				
TOTAL COST OF PRODUCT.				

Fig. 8—The constants for hourly burden, tonnage burden and core shop expense obtained on this foundry cost sheet of the Turner & Seymour plant are its most important features. The other averages obtained are useful guides to show the trend of direct labor costs and the value of good castings produced, especially in the form of graphic charts. For the use of the constants see the estimate card, Fig. 13. The constant used is an average of the constants for the preceding six months.

A weekly "foundry cupola report," a copy of which is here reproduced as Fig. 2, is notable for its compactness. Each day, for example, requires but one horizontal line.

With all shipments of customers' castings one copy of a "memorandum of goods shipped" is sent, a duplicate sheet being sent at the same time to the office. This form has five vertical columns with these headings: order number, your order number, number of pieces, marks or pattern number, weight. With castings made for the company's own machine shop, a small slip is sent which is entitled "machine shop castings charge." This form has vertical columns with the headings "order number, pattern number, number of castings, and weight," also spaces showing department and individual to which delivery was made. A plain manila sheet serves as a manifold copy for the foundry office.

A monthly "foundry weight record," Fig. 3, compiled by days shows by days and by weekly totals the weight of castings sent to customers, to the machine shop, used directly in the foundry, and the daily and weekly totals of good castings and of bad castings.

The monthly "foundry report" is the form which summarizes the cost data. This is ruled up on a plain loose-leaf sheet and its form is made clear in the illustration, Fig. 4. On this form is brought together the information which makes it possible to obtain an iron factor and an hourly overhead rate both of which are so essential in making intelligent estimates and quotations.

The item "x-1" is a symbol for all indivisible foundry labor; "607-F" is a symbol for the various minor supply items charged to the foundry during the month; "L. P. & H." means "light, power and heat." The use of the other nine vertical columns is shown by the heads, the initials "O.H." meaning overhead. The items included in these overheads are described in the following paragraph.

The practice of dividing the burden into "metal overhead" and "labor overhead" is not common, but years of experience at this plant have proved its value. The metal overhead includes all the variable, and the labor overhead all the fixed burden charges. The metal overhead contains such items as general indivisible labor expense, molding sand, general supplies, light and power, etc.; that is, those expenses which will change with volume of business and number of working days. The labor overhead includes those items which seldom change, such as interest on investment, cost of supervision, taxes, insurance, etc. By this method the cost of metal melted contains those items of costs which may vary frequently with market and industrial conditions, and the total labor cost includes those items which change but seldom and then usually by relatively small amounts. Thus a fairly fixed factor in the business is not disturbed by including with it for estimating purposes other factors which are extremely variable. It has been demonstrated by records extending over several years that the iron factor and the hourly overhead rate thus obtained are extremely accurate, the proof being found in the close agreement of estimated and actual cost record

cards and in the profit (or loss) shown by the "customers' sheets" (to be described later in this article) and the profits as shown by the general ledgers.

The iron factor is found by dividing the total cost of iron melted by the tonnage shipped. The hourly overhead rate is determined by dividing the total labor overhead by the total number of direct or productive hours of labor on castings and patterns. The indirect labor is entered under the head of expense labor.

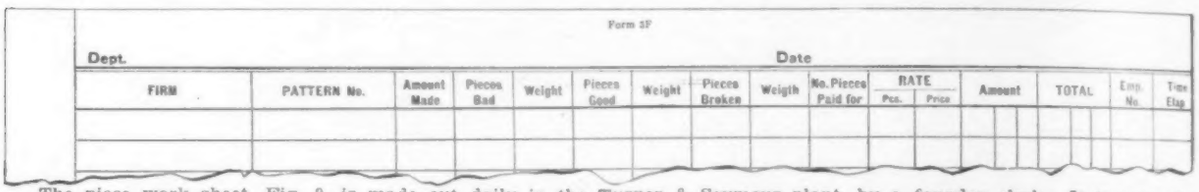
The "customers' sheet," Fig. 5, is made up monthly. On each horizontal line is the analysis of each job shipped. The form has fourteen vertical columns with these heads, as shown. The weight is obtained from the memoranda of goods shipped; the number of hours from the distribution of foundry

tations are varied according to the quantity ordered. This results in making many buyers order in sufficiently large quantities so that the production of castings becomes in the truest sense manufacturing rather than jobbing work.

At the Turner & Seymour Mfg. Company, Torrington, Conn., the analysis of costs is carried a step further in that all costs, as far as possible, are allocated to the two grand divisions of floor and bench work. A brief description of the forms employed and the methods by which constants are established follows:

The Turner & Seymour System

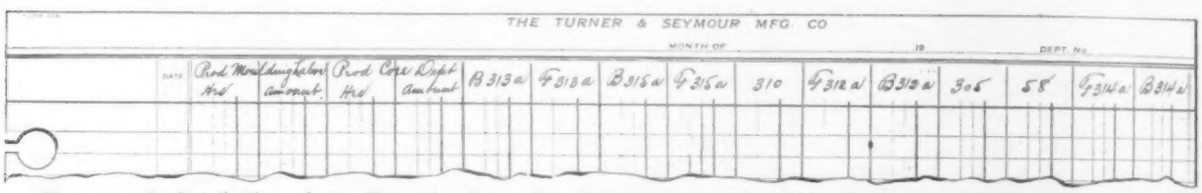
The body of the time clock card is of the regular form, but a section at the top (perforated) forms a


Form 1F

Dept. Date

FIRM	PATTERN No.	Amount Made	Pieces Bad	Weight	Pieces Good	Weight	Pieces Broken	Weigth	No. Pieces Paid for	RATE Pcs.	RATE Price	Amount	TOTAL	Emp. No.	Time Elap

The piece work sheet, Fig. 9, is made out daily in the Turner & Seymour plant, by a foundry clerk. It is unusually specific in regard to the division of the work as regards quantity and quality.


THE TURNER & SEYMOUR MFG. CO

MONTH OF ____ 19__ DEPT. No. ____

DATE	Rod Mold'g labor Hrs	Rod Mold'g labor Amount	Rod Core Dept Hrs	Rod Core Dept Amount	B 313 a	F 313 a	B 315 a	F 315 a	310	F 312 a	B 312 a	305	58	F 314 a	B 314 a

The payroll distribution sheet, Fig. 10, shows the thoroughness with which direct and indirect labor is separated not only into various accounts but also into floor and bench accounts when division in that manner is possible.

191

Car No.	FLOOR IRON Lbs. Used	Car No.	BENCH IRON Lbs. Used	Car No.	CYLINDER IRON Lbs. Used	Car No.	MOLD IRON Lbs. Used
Sprue		Sprue		Sprue		Sprue	
Fur. Scrap		Fur. Scrap		Fur. Scrap		Fur. Scrap	
Dom. Scrap		Dom. Scrap		Dom. Scrap		Dom. Scrap	
Stove Plates		Stove Plate's		Stove Plates		Stove Plates	
Steel		Steel		Steel		Steel	
Limestone		Limestone		Limestone		Limestone	
Coke		Coke		Coke		Coke	
	POUNDS		POUNDS		POUNDS		POUNDS
Total Floor Iron				Total Floor Coke			
Total Bench Iron				Total Bench Coke			
Gross Melt				Total Coke Used			

Ratio of Coke to Iron (Bench)—1:

Ratio of Coke to Iron (Floor)—1:

Ratio of Total Coke to Total Iron—1:

Form 41F

191

FLOOR MELT

	Lbs.	Lbs.	£
Gross Melt			
Sprues			
Defective Castings			
Mush			
Pig Bed			
Good Castings			
Loss in Melting			

BENCH MELT

	Lbs.	Lbs.	£
Gross Melt			
Sprues			
Defective Castings			
Mush			
Pig Bed			
Good Castings			
Loss in Melting			

TOTAL MELT

	Lbs.	Lbs.	£
Total Gross Melt			
Total Sprues			
Total Defective Castings			
Total Mush			
Total Pig Bed			
Total Good Castings			
Total Loss in Melting			

The melt sheet of the Turner & Seymour foundry is distinctive in the separation of charging weights and gross melt into floor and bench iron. This division carried throughout the cost accounting helps to make estimates more accurate by its partial recognition of the difference in costs known to exist between work on light and work on heavy castings. Fig. 11 is the front and Fig. 12 the back of the melt sheet.

payroll; the credits are usually for defective castings returned.

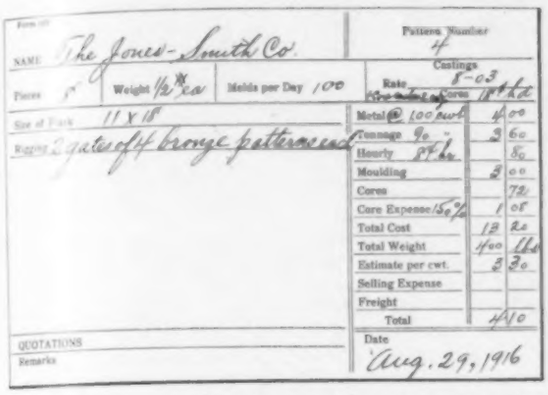
Another sheet called the "foundry record," Fig. 6, is much like the customers' sheet. It gives a yearly record of the monthly profit and loss for each customer and is so ruled that each sheet contains a record for six years. There is a horizontal line for each month of the year and a line for totals. An examination of the individual customers' records as found in this "foundry record" shows quickly which accounts are unprofitable and therefore undesirable at the existing quotations.

A single form of card, Fig. 7, is used for estimates and for file cost cards of completed work. It rarely happens that a blanket quotation on a group of patterns is given by this foundry; usually all quotations are made by unit pieces. By this method the quantity ordered determines the price, as quo-

pay check, which is signed by the employee and turned in as a receipt for payment of wages. The payroll sheet has a horizontal ruling for each employee and vertical columns for clock number, name, rate, six columns for hours worked each day, total hours, earnings, hours deducted, wages deducted, payment. A clerk in the foundry office also makes out a "piece work sheet," Fig. 9, for each day.

A sheet called "Foundry Piece Work Prices" is made up daily for each piece worker on molding or core making from which the payroll for men working by the piece is computed. This form has vertical columns with these heads: Pattern number, description, firm, pieces, molding rate, core rate per 100 pieces. A small card is kept in a permanent file which gives a brief description, the number and the molding rate of each pattern.

The payroll distribution of molding, core making



NAME The Jones-Smith Co. Pattern Number 4

Pieces 5 Weight 1/2 lbs ea Molds per Day 100 Rate Castings 1-03 Cores 18 lbs

Size of Flask 11 x 18

Rigging 2 gates off bronze pattern used

Metal @ 100 cwt.	4	00
Tonnage 90 "	3	60
Hourly 80 lbs		80
Moulding	3	00
Cores		75
Core Expense 150 %	1	05
Total Cost	13	20
Total Weight	400	lbs
Estimate per cwt.	3	30
Selling Expense		
Freight		
Total	4	10

QUOTATIONS

Remarks

Date Aug. 29, 1916

This estimate card, Fig. 13, shows that the actual weight of metal, a tonnage burden constant of 90 cents per cwt., an hourly burden constant of 8c. an hour and a core expense constant of 150 per cent, together with actual estimates of molding and core direct labor, are the items comprised in the net cost. The figures are fictitious.

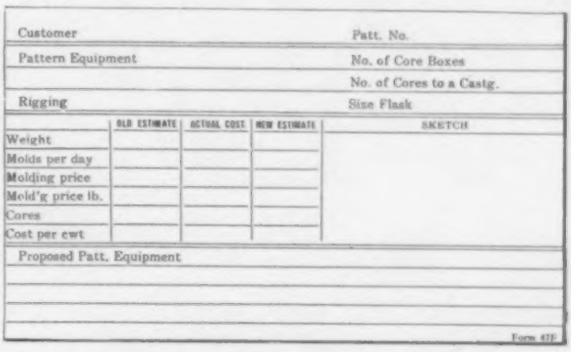
and pattern making is divided into the two general classes previously mentioned—floor and bench work—and subdivided as follows: Foundry department, indirect labor, under these heads; clerks, labor to repairs, night gang, yard gang, cupola, molding, core making, cleaning, shipping. The first four items are obviously not divisible into floor and bench work, but the remaining five items are so divided. The hours of direct labor in the foundry department are divided into bench and floor under the headings molding and core making. Wherever possible the work of the pattern shop is similarly divided into floor and bench classes under the headings: Experimental work on machine molding, repairs to patterns and machines, core boxes, flasks, pattern work for plant equipment, patterns for customers, work for other departments (charged at cost), core box repairs. The indirect hours in this department are indivisible and are comparatively small in number, including but little except sweeping. This item is handled in the same manner as the indirect labor in the foundry department.

The two sides of the melt sheet are shown in Figs. 11 and 12. The interesting feature of this sheet is the division of the melt into floor iron and bench iron. This division, while it does not make possible exact knowledge of melting costs of the remelt and oxidation losses on individual patterns, does recognize that these cost factors are frequently widely different on light or heavy castings and helps to make estimates on new work of either class more accurate. Where the patterns do not widely vary in character, it is highly probable that extreme subdivision of costs does not produce data sufficiently valuable to pay for the increased cost of gathering and segregating the information.

The experience of the Turner & Seymour Mfg. Company has proved that knowledge of the variations in cost between floor and bench work is worth while and that the clerical cost of this segregation into two classes instead of one is not excessive in view of the gain in accurate estimating. The melt sheet needs no detailed description, as the illustrations show the data considered and the summaries obtained. The planning department has a card for each car of iron and the melt sheet is sent to the planning office where the entries of iron and other materials consumed are made upon a perpetual inventory sheet. Physical inventory is made each three months as a check upon the perpetual inventory.

A "customer's record sheet" is kept on a file card whereon is shown the tonnage, the cost per hundred weight, the selling price per hundredweight, the total cost and the total selling price.

An "iron foundry report," divided into floor and bench work, is compiled monthly. The steel, pig iron, sprues, foreign and domestic scrap are added together to obtain the total melt. Deducting the weight of defective castings, pig bed, sprues, etc., gives the net melt; by deducting the tonnage of good castings from this result, the loss in melt is obtained. On this report also appear the amounts of molding sand, fire sand, clay and brick used during the month.

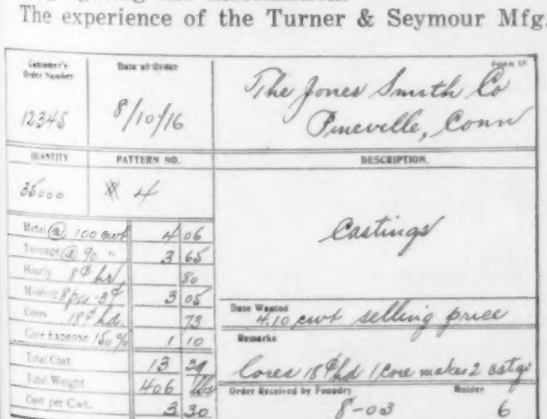


Customer				Patt. No.
Pattern Equipment				No. of Core Boxes
				No. of Cores to a Castg.
Rigging				Size Flask
	OLD ESTIMATE	ACTUAL COST	NEW ESTIMATE	SKETCH
Weight				
Molds per day				
Molding price				
Mold'g price lb.				
Cores				
Cost per cwt				
Proposed Patt. Equipment				

Form 42E

This card is used to compare actual costs against estimates and contains a space for a new estimate with other spaces for notes on equipment and proposed changes.

A summary of foundry costs, Fig. 8, is made each month, from which is obtained six constants for use in estimating on new jobs, three for floor work and three for bench work. A constant for the hourly burden is obtained by dividing by the total productive (or direct-labor) hours an aggregate composed of such items as general foundry expense, a pro-rata share of general plant expense, heat, light and power, general repairs, supervision and clerical work, taxes, insurance and depreciation. A tonnage burden constant is obtained by dividing the total wages of the yard gang, the night gang and the indirect payroll of the cupola, molding and cleaning crews, together with expenses charged to these items, by the number of pounds of good castings. A constant for core expense is obtained by dividing the total core room expense by the total direct hours. An average of the cost per pound of good castings is obtained by dividing the net melt (in terms of dollars) by the number of pounds of good castings. Averages of the cost per hour of the direct labor of molding and core making are obtained by dividing the total direct wages of each by the corresponding number of direct hours.



Customer's Order Number 12345 Date of Order 8/10/16

The Jones Smith Co Pineville, Conn

QUANTITY	PATTERN NO.	DESCRIPTION
36000	# 4	Castings

Metal @ 100 cwt	4	06
Tonnage @ 90 "	3	65
Hourly 8¢ hr		80
Moulding 8 pcs @ 8¢	3	05
Cores 18¢ lbs		73
Core Expense 150 %	1	10
Total Cost	13	29
Total Weight	406	lbs
Cost per Cwt.	3	30

Date Wanted 4.10 cwt selling price

Remarks Cores 18 lbs 1 Core makes 2 castgs

Order Received by Foundry 8-03 Molder 6

The Turner & Seymour cost record card, Fig. 14, is much like the estimate card, Fig. 13, and the same constants are employed to determine burden costs. The figures on this form are, of course, fictitious.

Differences in the Estimating Methods

In the Taylor & Fenn system the iron factor and hourly overhead are based on the computations of the previous month; in the Turner & Seymour system the constants used in estimating are based upon

the average of the various constants for the previous six months.

In the Taylor & Fenn system a cost of metal at the spout is obtained which includes the cost of raw materials, molding sand, general labor, general supplies and all other variable overheads, this cost of metal melted divided by the weight of castings shipped giving the iron factor used in estimating. In the Turner & Seymour system the actual cost of metal is used plus a tonnage constant which includes the charges for supplies to, and the indirect labor of, the cupola, yard gang, night gang, molding and cleaning. Both systems use actual time estimates for molding and cores. The Taylor & Fenn system uses an actual time estimate for cleaning, which in the Turner & Seymour system is merged into the tonnage burden. By the Taylor & Fenn method the core expense appears in the iron factor; by the Turner & Seymour method the core expense is obtained by multiplying the core direct labor cost by a constant obtained in a manner previously described. Both use an hourly overhead constant or factor in which is incorporated the fixed overheads, the interpretation of fixed overheads differing slightly in the two systems.

The Turner & Seymour Mfg. Company is planning to make some improvements in their system of cost accounting in the next few months. A few of the changes now under consideration and virtually decided upon are these: To secure an actual cost of metal at the spout which will include cost of metal, coke, flux, cupola repairs, cupola and yard labor and similar items. Some of these now appear in the tonnage burden. Another change planned is to distribute certain fixed overhead items and probably supervision and administrative expenses on an area basis rather than the present method of hourly burden. A third proposed change is to compute the tonnage burden on the basis of the gross melt rather than the net melt, as the latter method gives inaccurate results, in that it does not take into account adequately the wide variation in the amount of metal melted for light and heavy castings due to the larger proportionate weight of sprues returned for remelt from the lighter castings. Because of this same variation in sprues and gates and to some extent on account of the complex shapes of some castings and the other factors affecting cleaning costs, special study is being made to find a more accurate method of determining and allocating spruing and cleaning costs.

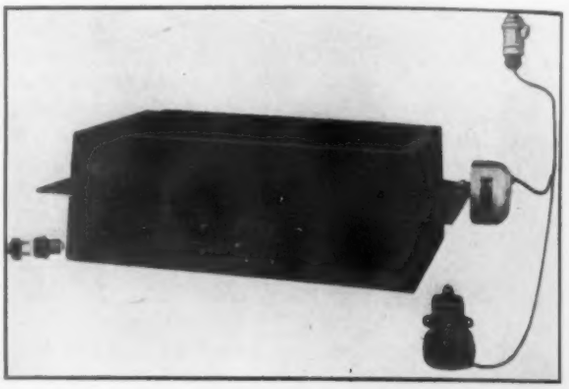
In setting forth these two cost systems, there is no intention of claiming that either is perfect. A large factor in their selection was the fact that they represented the present methods of two concerns which have had a long experience in the jobbing field and can claim to have given much thought to the creation of cost systems which would answer with reasonable accuracy the conditions peculiar to the business of a jobbing foundry. A foundry serving solely a machine building plant should be able to carry the refining of accuracy in cost accounting to much more exact conclusions because the factor of constant repetition of work on familiar patterns should make this easily possible—and profitable. In many cases it should be practicable to reach that desirable point of allocating overhead costs to individual patterns.

In a jobbing foundry, however, the constant introduction of new patterns and the short runs common to most patterns precludes any such refinement and a single overhead, or overheads based on broad subdivisions, are the most common forms in which burden costs are determined and constants or factors derived from these general groupings are usually employed in making estimates on new work. This matter of the extent to which the refinement of accuracy may be profitably carried is a subject which each foundry manager must consider in the light of his conditions and character of product.

An Electric Vibrator for Foundries

The E. J. Woodison Company, Detroit, Mich., has developed an electric vibrator for attachment to pattern plates or molders' tubs. It is intended as a substitute for hand or pneumatic rapping in a foundry. It is claimed that faster and truer lifts are secured by the use of this device, which in turn results in increased production.

The vibrator, which is designed for use on alternating-current circuits only, consists of a solenoid, the core of which produces the vibration as the current is cut



An Electric Vibrator Attached to a Pattern Plate to Take the Place of Hand Rapping, the Power Being Taken from the Nearest Lighting Socket and Controlled by a Knee Switch

off by the operation of the knee switch provided. The current for operating the vibrator is taken from a lighting socket or other convenient outlet, the work of installing it consisting merely of connecting the vibrator with the knee switch and also with the attachment plug that is screwed into the lamp socket.

Two styles of vibrator are made, one for plate work, which is the one illustrated, and another for attachment to tubs, benches or machines. Four sizes of vibrator are made. The two smallest are intended for plate work only, while the third is made for either plate or tub work and the largest one is made for tub work only. The current consumed, it is emphasized, is comparatively small so that it is possible, except in the case of two sizes, to place from 6 to 12 of the vibrators on the same circuit without exceeding the capacity allowed by the Board of Fire Underwriters, 660 watts. In the case of the two sizes that do not come in this group, it is possible to place three of one size and four of the other on the same circuit.

Oxygen for Opening Frozen Tap Holes

Opening frozen tap holes of blast or open-hearth furnaces by applying a heated iron bar to the hard or frozen metal in the hole and continuously feeding oxygen to the heated bar so as to maintain it in an incandescent state, and thus enable it to eat its way through, is the subject of a patent (U. S. 1,186,358—June 6, 1916) granted to Henry C. Witz, Johnstown, Pa.

The Upson Nut Company, Cleveland, Ohio, has called for redemption Oct. 1 the entire $1,200,000 issue of its preferred stock at 103. This company has already retired all of its $2,400,000 first mortgage 6 per cent bonds, which were also redeemable at 103. It is said that most of the preferred stock is held by the former owners of the Upson Company, who sold the Upson plant to the Bourne-Fuller interests several years ago for part cash and part Upson Company preferred stock.

Engineering Service Plus Machine Building

How the Gisholt Machine Company Has Added to Its Functions as Its Plant Has Added Size—Its Gray-Iron Foundry

BY O. J. ABELL

BUSINESSES expand under a wide variety of influences and in as many different ways. The spectacular growth is likely to be one, such as the automobile tire industry, where the manufacturer has but small part in the creation of demand yet can scarcely erect buildings rapidly enough to care for it. In direct contrast are other industries that build themselves from within by the accumulation of experience, by the development of a product for which demand is created on the basis of service, industries whose plant or equipment capacity is not infrequently made available in advance of sales, a guarantee that what is promised can be done. It is in fact by industry matured in this manner that standard and accepted practices are established. Among instances of individual organizations grown to the point of prominence in their particular lines, that of the Gisholt Machine Company is particularly interesting and suggestive. The Gisholt name is especially associated with turret lathes, but the fact that this type of machine tool puts upon its builders the necessity of a wider knowledge of tool building and metal working practice than would suffice for specialization in another direction is doubtless responsible for the general machine designing and building activity in which the organization is now also engaged.

The natural consequence of building up the broad experience corollary to the manufacture and marketing of turret lathes was the addition of other tools as standard products, and there have followed from time to time the Gisholt tool grinder, horizontal boring mill, vertical boring mill, the Gisholt automatic, and more recently a line of special lathes in 16 and 25 in. sizes. In addition, the development and production of the Periodograph recording instrument, described in THE IRON AGE, May 30, 1912, a mechanism requiring the machining methods of the jeweler shop, has been put upon a manufacturing basis.

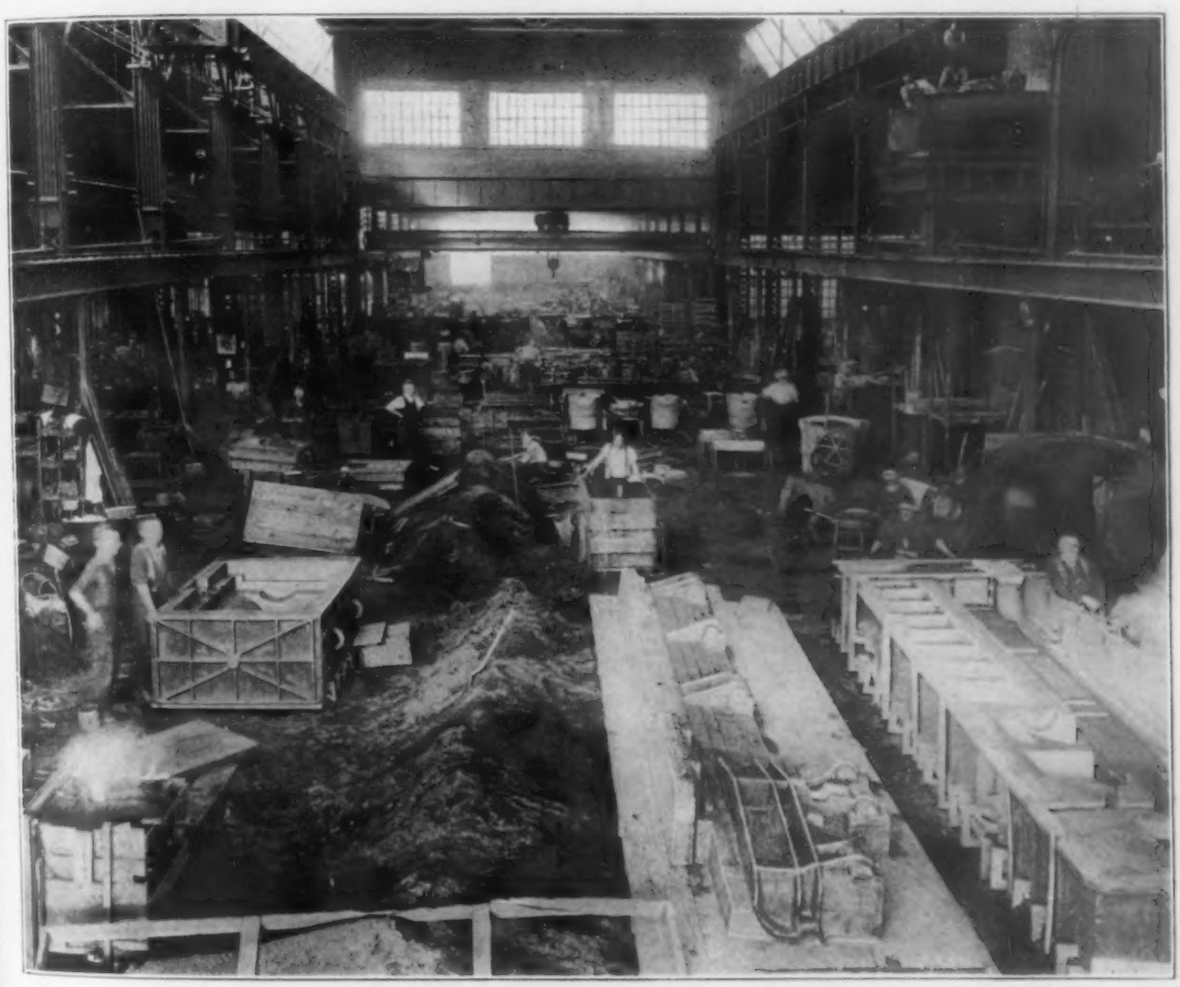


Fig. 1—In front of the crane is a 250-ft. length of floor for the large work and the dry sand molding. At the right are the cupolas and dry sand ovens; at the left the machine molding floors. Beyond the crane is the cleaning room with a length of 125 ft.

Here is a formidable diversity of product. It calls first for adequate plant capacity. It calls for exceptional equipment for manufacturing in the form of tools, jigs and fixtures if each of the products is to compete in a specialized field. It demands a wide knowledge of how the work for which each

machine is sold can best be done and how the machine should be tooled to do it. It places especial emphasis upon service. In all of these directions the Gisholt Machine Company has been doing interesting things.

In THE IRON AGE of May 30, 1912, a description of the then recently completed main shop of the company was presented. Apparently adequate at that time for an indefinite future period, it has this year been reinforced by the outright purchase of the Northern works of the General Electric Company, a shop of similar type, close at hand and fully equipped for machine operations duplicating those of the main shop. Since the date mentioned the gray-iron foundry has been enlarged also and the range of work possible of being handled in it markedly increased, as will be later described in some detail. Another machine shop is operated at Warren, Pa. Thus plant capacity has grown with the product.

The problems of developing the proper methods and equipment to manufacture the company's own standard products in these shops, of designing and building the machines themselves, and finally of adapting the machines to the needs of the customers to whom they are sold, through correct tooling, are met by dividing the engineering forces of the organization into three divisions, one for each of these tasks. In the shop, corresponding departmental divisions are made. The result is a specialization in each of three directions, from which has been accomplished (1) the complete rigging of all machining operations in the Gisholt shops with jigs and fixtures where it is advantageous to do so and the establishing of an experience in fixture design of broadest limits; (2) the standardizing of machine operation, assembly and erection upon a shop unit basis such that individual character in a machine in process is reduced to a composite of unit operations; (3) an analysis of the functions of small tools which not only has added to the assurance of a creditable showing for the company's machines in service, but has made the company a manufacturer of small tools and tool holders for general use. And the significance of this logical and interesting expansion as a whole is that out of a specialized activity in the building of one type of machine tool has been created a general engineering practice in machine building. That the company has carefully fostered this development is indicated by the fact that the entire capacity of the recently acquired Northern works is to be devoted to the building of special machinery on contract or hourly rates.

Fig. 3—A part of the floor for dry sand molding. In the foreground is a row of turret molds and in the background a boring mill base

The improvement of service which the machine tool builder can render the user of machines has also been illustrated by this company. In its shops it conducts a class for the instruction of machine operators from which are recruited expert turret-lathe men for the employment in the shops of turret-lathe owners. These men are familiar with the construction of the turret lathe in every detail as well as of turret-lathe operation.

The company also makes a practice before selling a machine to have an exact understanding with the prospective customer regarding the nature of the work to be done and has a standard list of questions which are submitted for answers. When a production estimate is made, it is on the basis of the following statement:

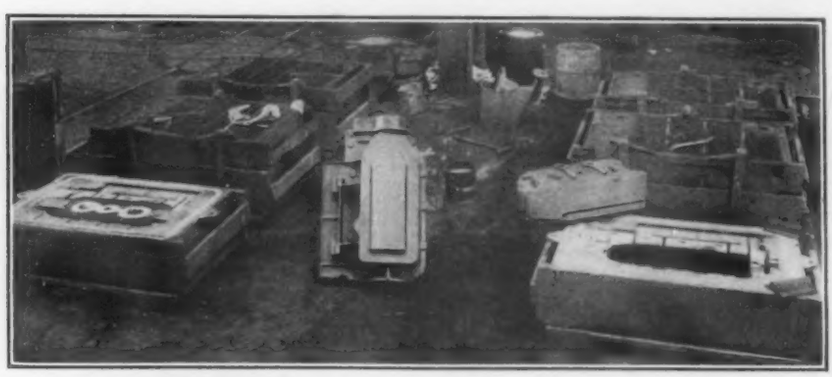


Fig. 2—An example of some of the lighter work put up on the main bay floor by hand. This is a tractor crank case, the mold being made by hand rather than on a machine because of the manner of placing cores

We estimate that your work described below can be machined as indicated on a Gisholt....., provided that the machine is installed, tooled and operated as we direct.

Piece..... Matl..... Drg. No.....
Part No.... Floor to floor time....to....
minutes each figured at a cutting speed of .....feet per minute, assuming parts are true to pattern and that the amount of stock to be removed from any surface does not exceed..... or amount shown on sample submitted.

The sale of a machine upon this basis of understanding renders the tool buyer a distinct service and it safeguards the manufacturer from unjust complaint.

At the bottom of the broad plan of general engineering service the foundry is an essential element. The foundry presents a capacity and equipment for a wide range of work. As may be observed from the accompanying illustrations, work of varied character ranging from castings, weighing as much as 12,000 lb. down to the smallest snap flask jobs are simultaneously in progress. Structurally the foundry has not been expanded upon a prearranged

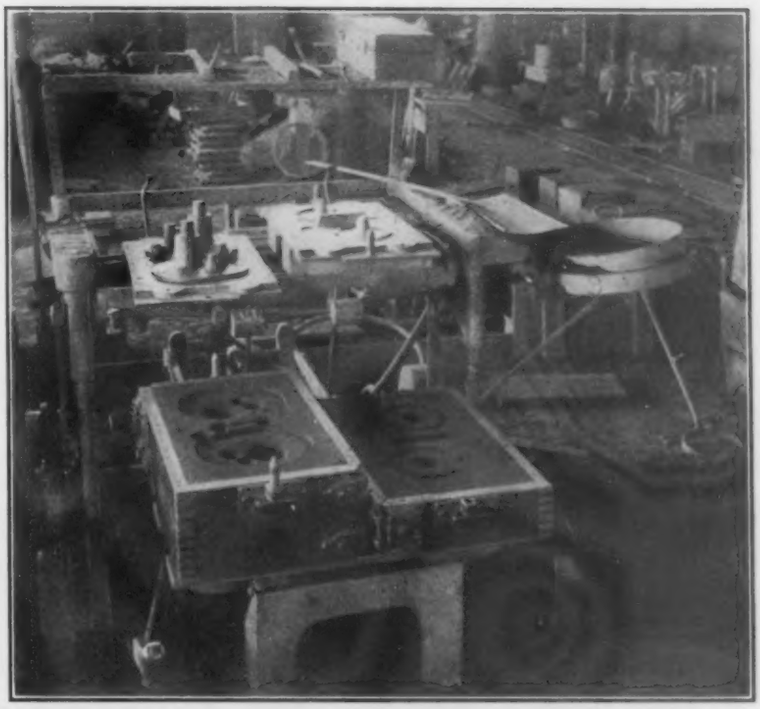


Fig. 5—A typical job on the squeezer machine floor in which a modern roll-over and squeeze machine in one operation makes both the cope and drag molds for two gear case covers

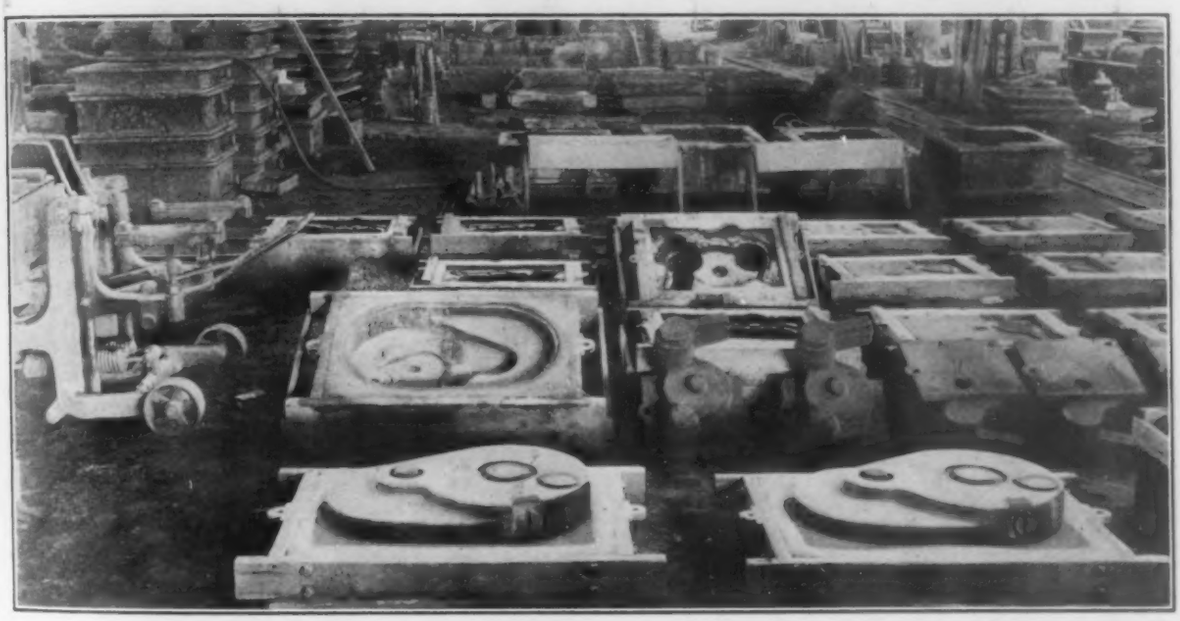


Fig. 4—Two interesting jobs made on Pridmore roll-over machines, both being tractor castings and representative of the jobbing work handled in this foundry

unit plan, but this does not prevent a satisfactory distribution of the different kinds of work on the floor and a direct progress of the work through the foundry.

The main bay is illustrated in Fig. 1. It has one runway carrying a 20-ton crane at a height sufficient to serve the charging floor of the cupola, and another lower runway carrying two 7½-ton cranes for the heavy work, dry sand molding and the cleaning department, the latter separated from the foundry floor by a partition wall. The bay has a total length of 375 ft., of which 250 ft. is foundry floor and 125 ft. the cleaning room, and it is 113 ft. wide. The lower crane runway is extended at the one end of the foundry for a length of 175 ft., serving a yard space used for the storage of the heavy iron flasks required for the larger work.

These flasks are arranged and kept in unusually orderly fashion so that they can be located promptly, their handling being rendered easy through the medium of the crane. On either side of the runway the lighter wooden flasks are stored. The entire yard is well lighted with tungsten incandescent lamps, so that the securing of flasks for the night operation of the foundry, or the returning of the flasks to the yard by the night gang, following the shaking out of the work of the preceding day, can be pursued without hindrance. The extension of the craneway at the opposite end of the building, beyond the cleaning room, serves as a temporary storage and loading yard for the finished castings. This yard has a stub spur of the track connecting the foundry with the machine shop and extends under the crane to facilitate the direct loading of castings. For the handling of the smaller castings a truck drawn by a Buda storage battery tractor truck is employed.

Centrally located at one side of the main bay

are the two cupolas, one lined to 60 in. diameter and the other to 48 in. and having aggregate capacity to supply as much as 140,000 lb. of metal per day. Opening off of the main bay on the side opposite the cupolas is the other principle section of the foundry, a building of saw-tooth roof construction, 60 x 280 ft., having two longitudinal bays. In the bay adjacent to the main foundry floor is put up the work suitable for making roll-over and jolt-ramming machines, and in the outside bay is the side-floor work at one end, the hand and power squeezer machine work and, at the opposite end, the core rooms and core ovens. The entire foundry floor area is thus divided into a section for the heaviest castings requiring hand work, a section for dry sand molding, adjacent to which are two large drying ovens of size sufficient to accommodate trucks 8 x 25 ft. and 7 x 25 ft. respectively, the heavier molding machine work, the light work for squeezer machines, the side-floor work, and along one wall of the main foundry bay a section for bench work.

Hot metal is distributed to these various floors in ladle trucks of 2000 lb. capacity on an industrial railway, the molders pouring off with ladles of 50 and 200 lb. capacity. The trackage is arranged to reach the various floors in a way to reduce the distance in which iron must be carried by hand to a minimum, inasmuch as it has been found that the molders put up an appreciably larger amount of work when the pouring off is rendered as easy as possible. For the same reason a point is made of furnishing the molders with ample help in the handling of the metal. For the larger work, which is all under the cranes, the iron is distributed directly in ladles from the cupola, the ladles having capacity of 2500, 3500 and 8000 lb. The larger of the two cupolas supplies the metal for the general work of the foundry and is the one to which the ladle track leads, the cupola metal being poured directly into the ladle cars, as indicated on Fig. 1. The smaller cupola melts the iron of special mixture of which the large machine beds, requiring a dense iron, are made, as well as the castings for which an especially smooth finish is desired. This iron is handled entirely with the large ladles and crane.

Some of the larger work, consisting of long lathe beds, cast both in pits and metal flasks, is shown in the foreground of Fig. 1. The molds for these beds, for boring mill bases, for the turrets, chucks, spindles and similar castings, are made up in dry sand molds. A view of a part of the work of this kind is shown in Fig. 3, with a row of turret molds in the foreground and in the background a mold for a large boring mill, the casting weighing 1700 lb. In addition to the castings for the company's own standard products, a large amount of outside work is done, including gas engine and tractor castings. In fact, the variety of work continuously handled is such as place wide limits on the range of the foundry, as fine molding as that required for the casting of air-cooled gas engine cylinders being included among the work produced.

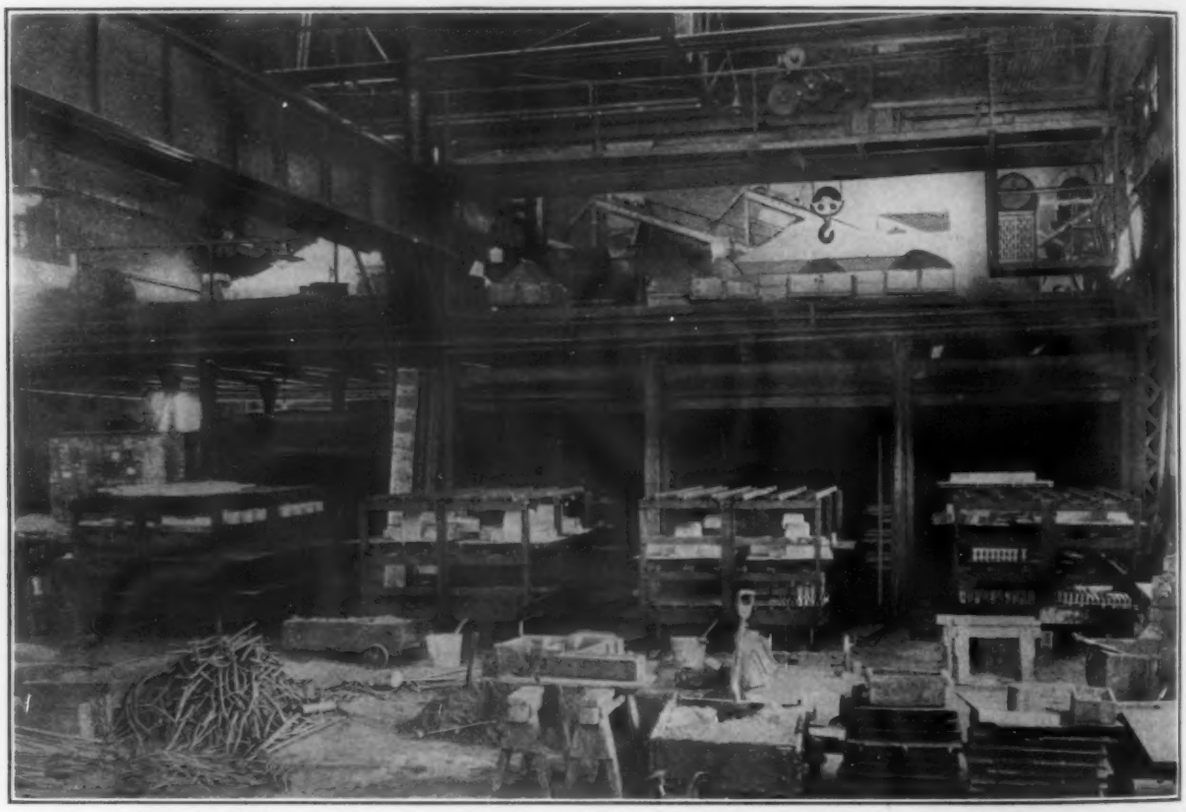


Fig. 6—Above the ovens in the core department sand is distributed to bins as desired. The wall shelves in the ovens may also be seen

An example of the jobbing work done is illustrated in Fig. 2, this being a tractor crank case. The mold at the right is shown before the cores are set and that at the left with the cores in place. The pattern is shown between the two flasks. This mold has been made up as a two-part job rather than a three-part job by hanging several small cores in the lower part of the mold, though this method also necessitates the mold being put up by hand rather than on a jolt machine. Eleven cores in all are required. The mold is made up in a flask 24 x 36 in., with a 10-in. drag and a 6-in. cope. The castings weigh 105 lb. each, and one man makes up a minimum of seven per day.

A large variety of castings is poured in molds made up on jolt ramming and roll-over machines.

Fig. 7—The concrete pattern storage building has compartment walls, with fire doors and a sprinkling system

Two such jobs are illustrated in Fig. 4. In the foreground is a tractor casting having a metal section of about ¼ in. and weighing 52 lb. This mold is made in flasks 24 x 34 in., of 8-in. cope and 4-in. drag. The patterns as originally made provided for a large mushroom core hung in the drag. Instead of making this expensive core, the core print was stripped off of the pattern and the core box, fitted with a couple of pin plates, was used for the drag. The mold, in the simple form shown, was the result, all made in green sand. In the background of this view is shown the mold for a gas engine casting, also made on a Pridmore roll-over machine. This mold calls for four cores, the principal one of which is shown, top and bottom views, leaning against the flask. These cores are made as cover cores to permit the casting to be poured without a cope. The flask is 20 x 24 in. and the drag is 10 in. deep.

In the molding of small work, this foundry has developed practices which contribute to excellent production at small cost. Wherever possible the patterns are mounted on boards for machine molding, Mumford and Pridmore power squeezers being largely used with a few machines of other type, including a hand roll-over squeezer machine built by the Arcade Mfg. Company, illustrated in Fig. 5. Flask sizes have been standardized and brought down to three general sizes, 12 x 19 in., 14 x 14 in. and 16 x 16 in. Aluminum frames have been made for these machines to fit any board. The gating of the patterns for the squeezer work is also some-

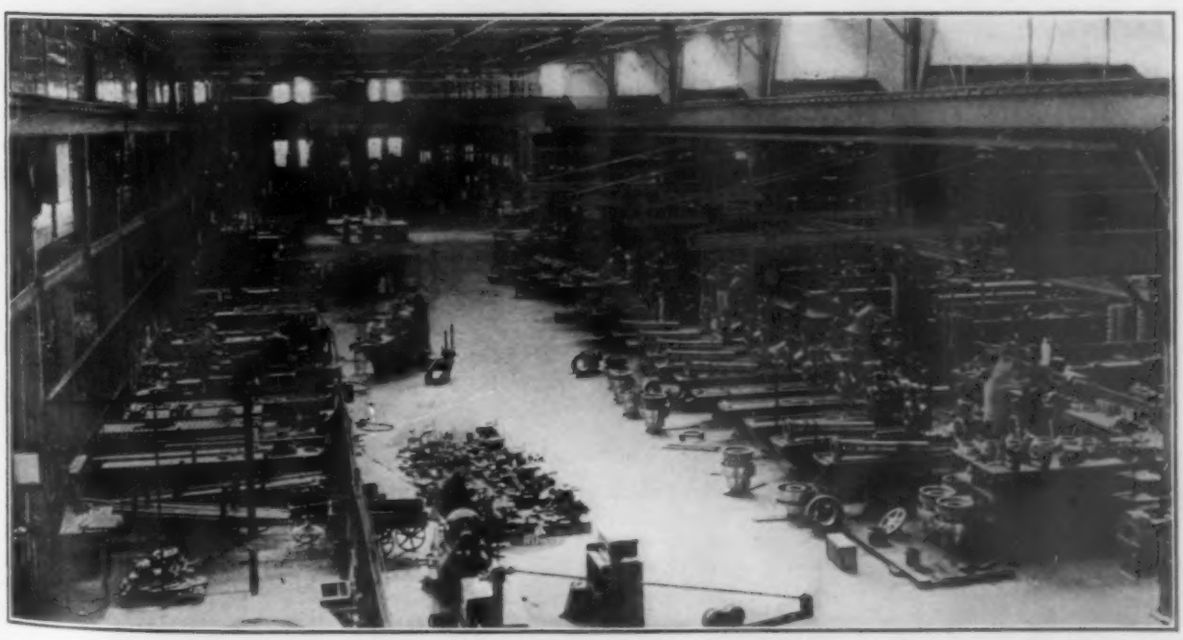


Fig. 8—One corner of the machine shop of the main works of the Gisholt Machine Company. At the right of the aisle is a part of the department for manufacturing the company's standard machines; at the left a part of the department for building jigs and fixtures

what unusual. The gating is all kept in the cope with small, straight runners only in the drag, and then as high as possible. By cutting a sprue to the top of the mold of larger cross-section than the aggregate of the runners, the pouring gates are kept full of metal, and being entirely above the runners, a positive skimming action results. One of the typical squeezer jobs is illustrated in Fig. 5, the casting being a bearing plate and gear case cover for a gas engine and weighing 11 lb. The pattern is mounted to cast two pieces in a mold and both the drag and cope flask are made up simultaneously as shown on the machine. A production of 60 to 80 molds, or a minimum of 120 castings per day, is obtained, with unskilled labor trained only for this job.

The wide variety of castings made places heavy demands upon the core-making department. This is located, as previously indicated, in one corner of the foundry. A view of the large core ovens, which

affords the maximum of protection against fire loss. Connecting passages are protected by automatic fire doors and the building is equipped with a sprinkler system. Against the loss of patterns by misplacement equally adequate protection is had. Except in the case of those too large to handle in that manner, the patterns are stored on shelves, the shelf locations being systematically numbered. In each storage room is a card index. On these cards a record of the pattern number, its proper shelf location and its use is kept.

In connection with the card index, a scheme of color tabs is also used. A tab of one of these colors indicates that the pattern is on the shelf, another color indicates that it has been returned to the owner, another color that it is in the foundry, another color that it is in the shop being altered, etc. These tabs are small enough to be fastened on the top of the index card, and if the file is properly kept, constitute a complete guide to

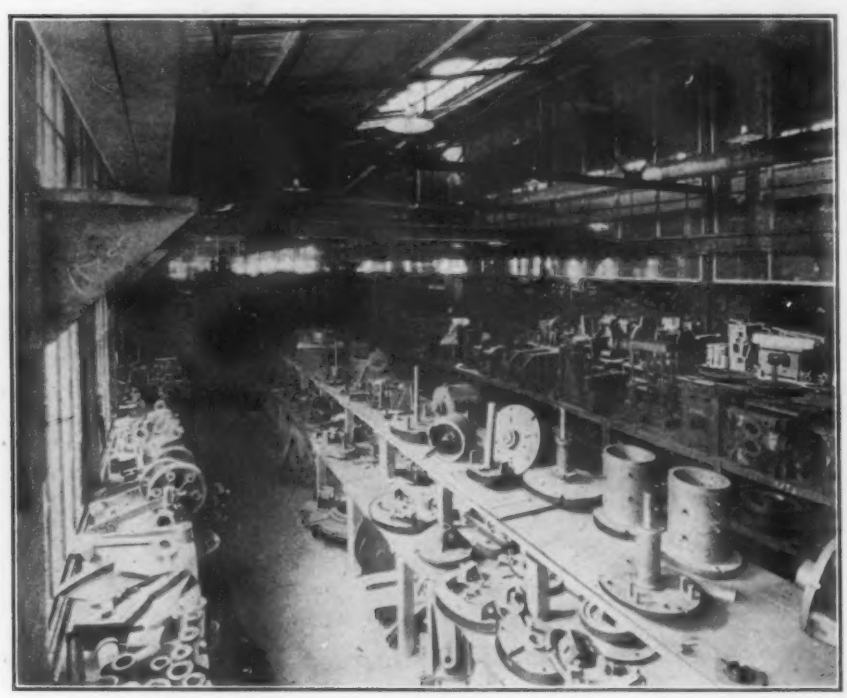


Fig. 9—The large number and variety of jigs and fixtures in the fixture storage room, designed to make the building of the company's standard product a manufacturing operation.

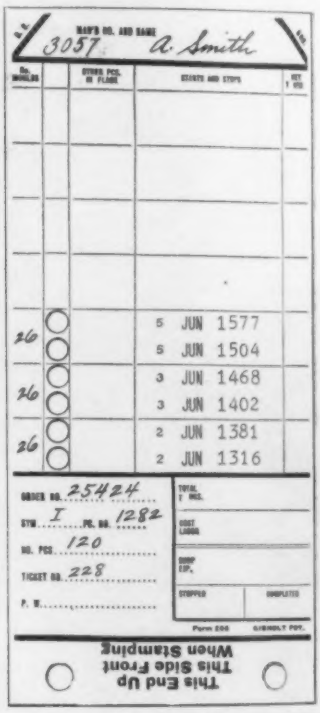


Fig. 10—Card used in connection with the periodograph

are 8 ft. wide and 12 ft. deep, with the core trucks, is shown in Fig. 6. For small cores, three drawer-type ovens also are installed. As may be noted from the illustration, the capacity of the car ovens has been increased above loading capacity of the oven floor and the drying cars by building shelves around the walls in what would otherwise be dead space. The core sand is mixed on a floor built immediately over the ovens. A bucket elevator brings the sand up from the storage bins into which the sand is unloaded from incoming cars and discharges upon a series of inclined belt conveyors. a week's supply of core sand is continuously at hand for mixing. When prepared the sand is lowered to the floor of the core room by means of the crane which spans the bay. The finished cores are placed on racks pending their being required in the foundry, at which time they are delivered to the molder. Standard cores $\frac{3}{8}$ in. in diameter and larger have established locations and the molders come and get them as required.

Exceptional facilities are provided for the storage of patterns. A three-story building of reinforced concrete construction, with each floor divided into small rooms separated by concrete walls,

the present location of any pattern desired. In Fig. 7 a view in the pattern storage building is shown.

The handling of the patterns required on foundry orders is also interesting. Where castings are required, a blueprint list of the parts giving the quantity wanted is issued to the foundry. From this list, foundry orders or tags are made out for each piece, which are sent to the pattern clerk, who attaches the tags to the pattern. This tag gives all the necessary information to proceed. If the same pattern is to be used on more than one order number a separate tag is made out for each order number. The patterns are then sent down to a place of temporary storage adjoining the foundry, whence they are delivered to the molders doing the various classes of work as rapidly as they finish the preceding job.

The molder takes the tag from the pattern and immediately turns it in at the periodograph station, where a card is made on which is registered the period of starting the job. This periodograph card also shows the information transferred from the pattern tag and in addition the number of castings

(*Continued on page* 520)

Reclaiming Waste Molding Sand

Accumulation of waste molding sand proves a source of inconvenience to nearly all foundries, and where yard space is limited the removal of this waste entails a considerable expense. The reclamation of scrap iron in these refuse piles is not often attempted, as both the washing and sifting processes are too expensive and tedious. The Modern Foundry Company, Oakley, Cincinnati, recently found it necessary to remove a large accumulation of foundry sand, and the outfit described shows how this is being done at a low cost, and at the same time nearly all valuable scrap in the pile is saved.

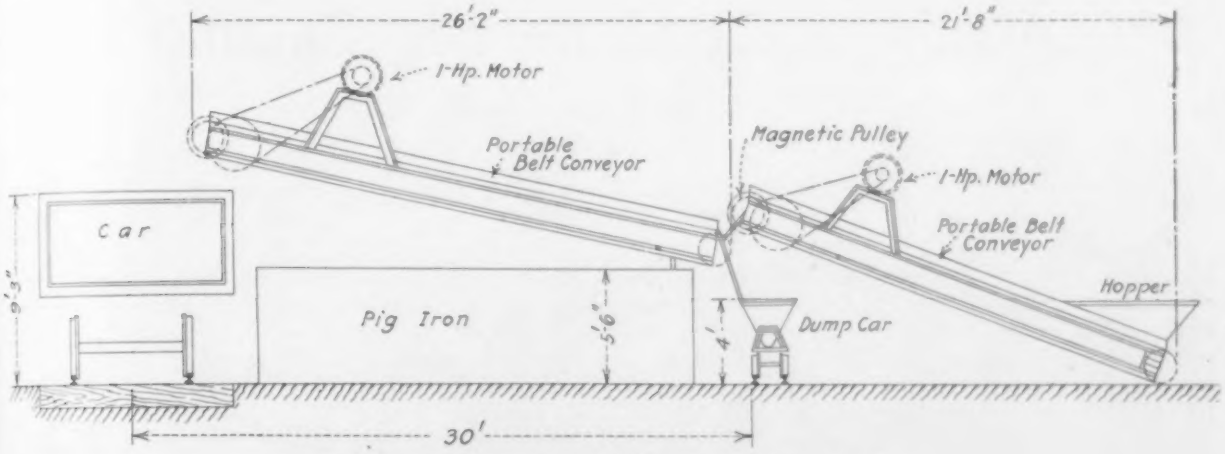
The outfit, which was designed and built by L. H. Sprague, manager engineering department, the Wirthlin-Mann Company, Cincinnati, consists simply of two belt conveyors, one with 23-ft. centers and the other with 26-ft. centers. Jeffrey 18-in. belts are used, the pulleys and motors being mounted on structural-steel frames. The conveyor frames are made of light channel iron, reinforced longitudinally with angle iron, and in spite of their light construction they are strong enough not to require any center supports.

The refuse is shoveled into the shorter conveyor, and passes over a Cutler-Hammer magnetic pulley having the magnetic coils on the inside of the pulley. The metal, as it passes over the pulley, adheres to the belt, while the sand is discharged upon the second conveyor, from which it is dumped into the car as shown. The metal is carried partly around the magnetic pulley and is dumped into a chute at the point where the belt leaves the pulley.

These conveyors are loaded by hand, and have a capacity of 1 ton a minute. They are electrically driven, a 1-hp. motor for each conveyor being sufficient.

One of the advantages of the system is that either conveyor can be used as a separate unit, and on account of their light construction they can be moved by traveling cranes very quickly from one part of the yard to another. Probably the largest amount of time required for this is in making the electrical connections, which is a matter of only a few minutes at the most.

The saving in loading this refuse over the hand method of handling it is self-evident, and the foundry company states that the amount of material reclaimed in six weeks has more than paid for the original cost of the outfit.



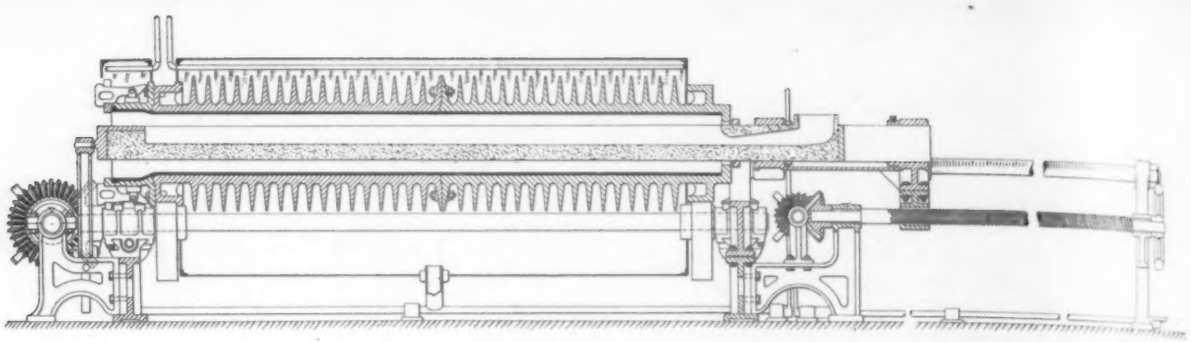
Elevation of a Plant for Reclaiming Waste Molding Sand

A Combination of Two Portable Belt Conveyors and a Magnetic Separator Is Employed to Remove the Ferrous Metal from Waste Molding Sand

New South Wales Steel and Iron Output

The pig-iron output of New South Wales for the first half of 1915 is recently published as 42,000 tons, with the steel ingot production at 38,000 tons, as compared with 75,150 tons and 24,420 tons respectively for all of 1914. The Iron and Steel and Allied Trades Federation estimates the total 1915 production to have been 120,000 tons of pig iron and 99,000 tons of steel.

The Sidney Tool Company, Sidney, Ohio, manufacturer of woodworking machinery, has placed on the market a 15-in. engine lathe of either the plain or quick-change type. It is driven by a four-step cone pulley and is equipped with double back gears. The swing is 17½ in. over the shears and beds ranging in length from 6 to 12 ft. are built.



A Centrifugal Machine for Casting Pipe

Results Obtained by a Brazilian Inventor Using a Rapidly Revolving Permanent Mold—Some of the Claims—Tests of the Iron Castings

A BRAZILIAN inventor, now in the United States, announces the successful commercial operation in Brazil of a revolutionary method of producing cast-iron pipe. It involves the application of the principle of centrifugal force to molten metal in a permanent mold. Briefly, regulated quantities of cast iron are introduced into a rapidly revolving water-cooled cylinder where, by the centrifugal force exerted, the metal is spread uniformly upon the surface of the mold and within a few seconds the pipe is withdrawn from the other end of the machine at a white heat; the pipe is not subjected to any further treatment except the tarring. Uniformity of section, speed in production, facility in handling and strength of the metal are among the claims made for the invention.

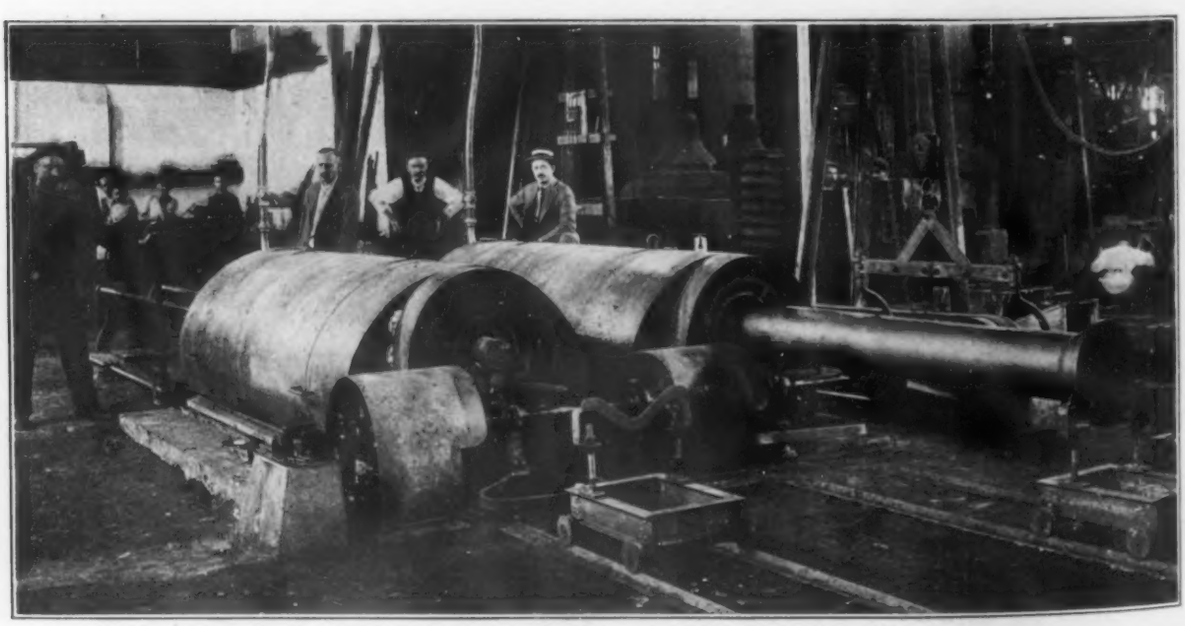
COMMERCIAL RESULTS IN BRAZIL

At present 13 of these new machines are operating commercially at two plants in Brazil, turning out various sizes of pipe from 4-in. to 15-in. in diameter and from 4 ft. to 14 ft. long. One set of the machines is producing pipe from blast-furnace metal at the blast-furnace plant owned by J. J. Queiroz at Esperanza in the State of Minas Geraes —the only blast furnace in Brazil. Its output is about 30 to 40 tons per day of charcoal iron, which has been contracted for by the Companhia Brasileira de Metallurgia for the production of pipe. The other plant employing the new process is at Sao Paulo, Brazil, where the main office of the above company is located. Here cupola metal is used, the mixture including pig iron from Esperanza, scrap iron and imported irons.

The inventor of the process is D. Sensaud de Lavaud of Sao Paulo, and he has as his collaborator, Fernando Arens, Jr. The system is known now as the Sensaud-Arens, it is patented in Brazil and other countries and letters patent have just been granted in this country.

With a view to introducing the process into the United States, Mr. Lavaud has had a machine built in the Buffalo district which has produced for exhibition and other purposes a quantity of 4-ft. 4-in. pipe. Arrangements are also being made to exhibit the process at the American Foundrymen's Convention in Cleveland, Sept. 11 to 16.

The application of centrifugal force to making cast-iron pipe dates back to 1857. None of the previous attempts were successful commercially, Mr. Lavaud says, although patents were secured in 1865, 1882, 1892, 1895, 1897, 1900, 1911, 1912 and 1913. The majority of the processes consisted in lining the molds with sand and there were serious mechanical complications in the use of a rotary mold. Attempts to form castings in permanent molds met with dis-



A 12-ft. 10-in. Pipe Coming from One of the Centrifugal Casting Machines at Sao Paulo, Brazil. Twelve of these pipes each hour are made from each of these two machines, constructed in pairs. Each pipe weighs 120 kg. (240 lb.) and is 0.24 in. thick. The inventor, D. S. Lavaud, is the figure at the extreme right of the group

appointment. The metal did not spread evenly in the mold, which consisted of a cope and a drag. Another difficulty was the extraction of the casting from the mold. It was necessary to stop the machine, remove bolts, etc., in order to get a casting out. The time required had a prejudicial influence on the quality of the iron.

THE INVENTORS' EARLY EXPERIMENTS

The steps leading up to the perfection of this interesting process were related by the inventor as follows:

It was in Santos, State of Sao Paulo, Brazil, in 1914 that I started my first experiments, with the assistance of Fernando Arens, to cast pipe in a permanent rotary mold. In the beginning our disappointments were as numerous as they were disheartening. A perfect pipe seemed impossible; the metal did not spread evenly over the surface of the mold; the pipe was brittle as glass and had many defects.

We then decided to use a trough for introducing the metal into the inside of the mold and the result was more satisfying. The first machine was constructed to produce 4-in. pipe about 3 ft. long, but realizing the difficulties in producing such small pipe, we built a machine to produce 6-in. pipe 7 ft. long.

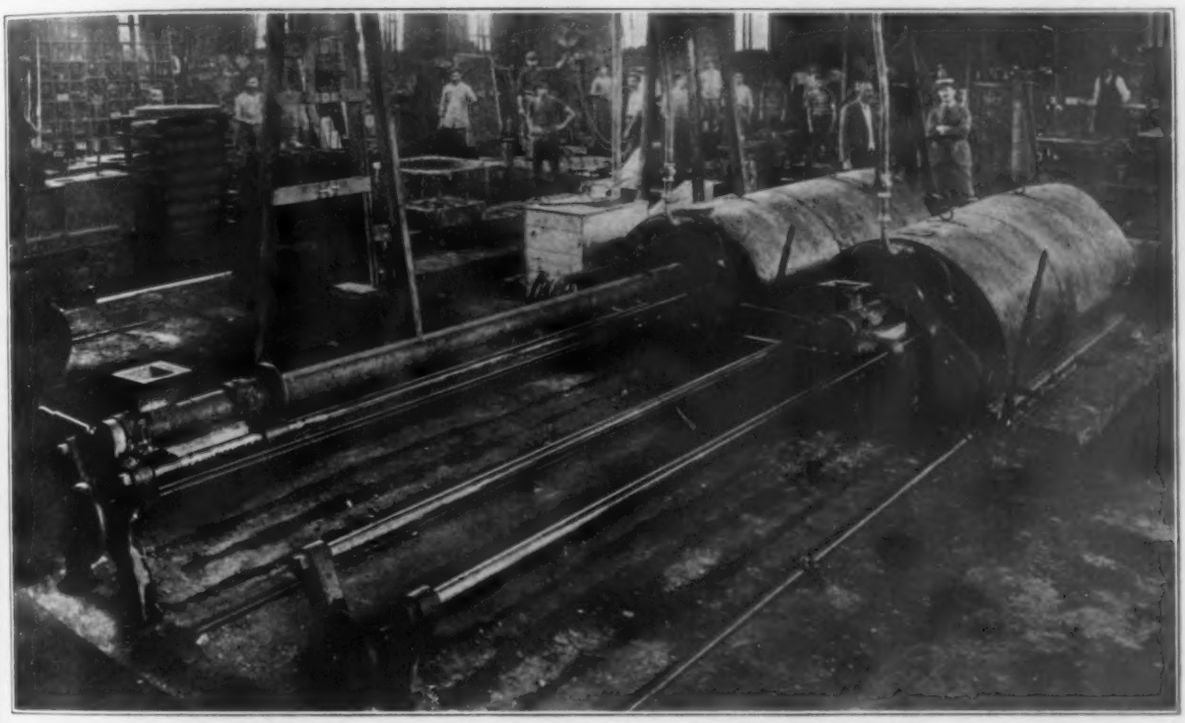
Because we did not know what would happen when casting 100 kg. (220 lb.) of metal under such conditions, we decided to heat the mold to about 600 deg. Fahr. It was impossible to extract the pipe from the mold, which was an iron bar with a 6-in. bore, because it required three minutes for the casting to decrease in diameter. It was then like glass, breaking easily under a hammer. The iron used was the ordinary metal used in foundry work. Three more attempts turned out likewise, with the extraction of the pipe more difficult each time until the fourth pipe could not be removed at all.

Though thoroughly discouraged, we later decided to make further trials and to use iron heated to a higher temperature and containing at least 2.50 per cent silicon. We did not heat the mold and Mr. Arens and myself had to pour the metal, as none of the foundrymen dared. Success attended this trial, for the pipe could be extracted almost immediately—5 to 10 seconds after. The pipe could not be broken with a light hammer, the metal was soft and could be easily machined. In casting the second pipe the mold had a temperature of 300 deg. Fahr. and the extraction of the pipe was now difficult and the metal harder. These conditions became aggravated until the fourth pipe was taken out only with the greatest difficulty and had the same defects observed when the early 4-in. pipe was made.

These attempts warranted the following conclusions as the basis of a successful operation of the process:

1. A permanent, rotary and cold mold.
2. Immediate extraction of the pipe after solidification.
3. The use of very hot iron.
4. A silicon content of 1.80 to 2.50 per cent.

The use of cold molds seems strange at first; but the metal is distributed in the interior of the mold over its entire length, just the same as water over a weir, and thus the cold permanent mold does not render impossible the even distribution of the metal.



Showing the Trough by Means of Which the Hot Iron is Introduced Into the Sensaud-Arens Centrifugal Casting Machines for Making 12-ft. 10-in. Pipe. It is another view of the 10-in. machine shown on the opposite page

THEORY OF THE PROCESS

According to Mr. Lavaud's theory, the metal falling in the cold mold will congeal at once, forming a solidified crust which creates a centripetal force; the pipe then detaches itself from the surface of the mold, and the space between the mold and the pipe becomes an insulating chamber, in which the air which is at a high temperature graduates the solidifying of the still molten mass and at the same time anneals the crust first formed. When the mold is at a temperature of 500 to 600 deg., the crust will not form and the whole mass of iron cools rapidly, with very slow contraction and consequent difficulty in removal.

The inventors found that the thickness of the walls of the mold could be greatly decreased. The great difference in the temperature of molds with thick walls subjects the metal in them to constant contraction and expansion, so that the internal surface splits increase with each casting made.

Any metal can be used in the construction of the mold. The final modification, as a result of extensive experiments, was the construction of a machine provided with a permanent rotary cold mold with ribs for cooling purposes, the cooling medium being an active water circulation. This is shown by the illustration at the head of this article indicating a

sectional plan of one of the early type of machines.

In the early stages of the development it is stated that only two casts per week for two hours at a time was the practice at the foundry, but from 18 to 22 6-in. pipes, averaging about 10 per hour, were made. This was continued for 5 months and the losses in that time, amounting to 15 to 20 pipe out of 800 cast, were caused by too cold a metal.

As a result of this experience the construction of seven machines was decided upon, two machines with interchangeable mold for pipes from 6 to 12-in. in diameter and 10 ft. long, and two machines with interchangeable molds for pipes 12-in. to 40-in. and 14-ft. long. The first machines were finished late in December, 1915, and the first pipes cast in January, 1916; all reported perfect and difficult to distinguish from steel pipe. Pipes with wall thickness of ⅛, ¼ and ⅜ in. were made with satisfactory results. The machines to make pipes up to 12-in. are used in connection with cupolas, while for the pipe over 12-in., metal direct from blast furnaces is employed in Brazil. One of the large machines was installed in February, 1916, and is successfully making 15-in. pipe 14 ft. long. It has been found that the larger the diameter of the pipe, the easier the process of manufacture.

The process of centrifugal casting is thus briefly described:

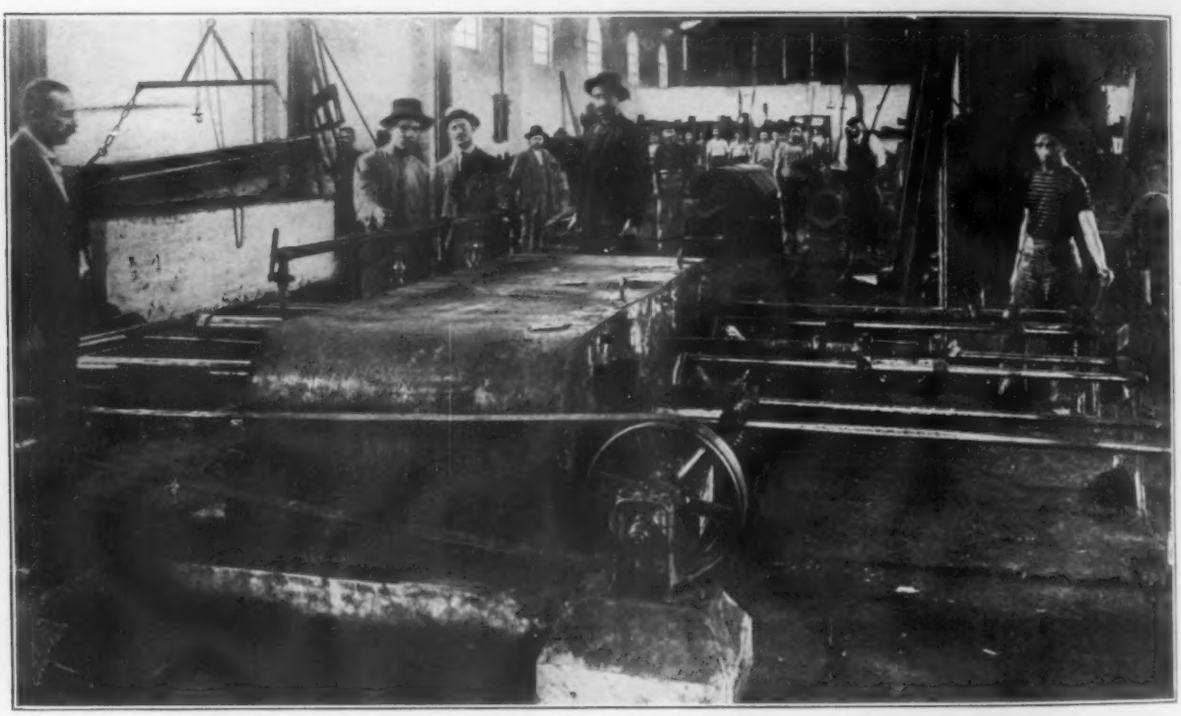
> The molten iron is brought to the machine and from graduated ladles is poured into the funnel at the end of the trough. The latter is then inserted in the revolving mold and turned 180 deg. when inside, so that the metal falls evenly on the whole length of the mold. The pipe leaves the machine a few seconds later, is placed on skids and rolled to the tar pit; it is then inspected as usual. No sand is used and cores and flasks are eliminated. The pipe walls, it is claimed, are of even thickness. The entire amount of metal entering the machine leaves it in the form of a pipe and there are no gates or excess to be removed.

The 4-in. machine at Buffalo is about 15 ft. long and 2½ ft. wide and located near a pit in which is a pump which furnishes water for the cooling as well as the propulsion of the mold itself. The capacity of this machine is 40 pipe per hour, 4 ft. long and 4 in. in diameter.

THE CHARACTER OF THE METAL

The question of the quality and structure of the iron from this process is important. Necessarily there is a decided contrast between the structure and condition of iron cast under such unusual conditions and that cast in sand molds where the cooling is much slower. The centrifugal action is also an important factor.

When casting by the new process in a rotary cold mold, the metal solidifies, say the inventors, probably in two to three seconds. This means that the segregation or separation of impurities is impossible, forming thus a completely homogeneous mass in which all the parts are equally distributed and the metal of a fine close grain. The pipe being removed immediately from the mold after solidification, the graphitic carbon does not change to combined carbon. That is, Mr. Lavaud holds that the quicker cooling prevents segregation and crystal growth and that the subsequent cooling after removal from the machine is of no influence in upsetting the favorable relations of the pipes' constituents, but at the same time insures a better metal.



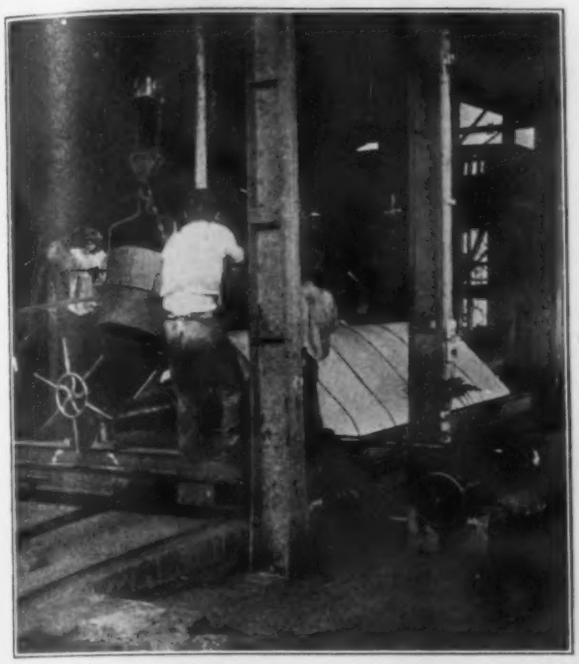
Three Centrifugal Casting Machines Operating at Sao Paulo, Brazil, Each Machine Producing 20 Pipes per Hour, 5 ft. Long and 4 in. in Diameter. Each pipe weighs 20 kg. (44 lb.) with a wall thickness of 0.16 in.

To these claims for consideration should be added the effect of the action of the centrifugal force on the metal, which is asserted as compressing and expelling the air preventing gas holes and forming a more solid and denser metal. The strength of the metal in pipes from this process is reported as two to four times that of the same metal cast in sand molds and verified by official tests.

Metallographic examination of the metal in these new pipes has not yet been completed, but it doubtless will bring out soon interesting results and probably corroborate some or all of the claims made. It is expected that THE IRON AGE will be able to supply this later.

HYDRAULIC TESTS BY BRAZILIAN CITIES

Some interesting tests have been made on vari-



Position of Ladle When Pouring Blast-Furnace Metal at Esperanza, Brazil, Making 14-ft. 15-in. Pipe

ous sizes of this new pipe by the water works departments of two large cities in Brazil.

The Department of Water, Public Works of Rio de Janeiro, Brazil, under date of Oct. 23, 1915, certifies that three pipes, made by the Companhia Brasileira de Metallurgia and having bell and plain ends, weighing 66.6 kg. (146.5 lb.) each, with a diameter of 16 cm. (6.25 in.), a length of two meters (6.56 ft.) and a wall thickness of 16 mm. (0.24 in.) resisted an internal water pressure of 22 atmospheres (4851 lb. per sq. in.) without any signs of breaking open, being hammered with a hammer weighing 2 kg. (4.4 lb.) from one end to the other. No higher pressure could be applied because of the pump's capacity.

The Department of Water and Sewerage Works of Sao Paulo, Brazil, certifies to the following results of tests made on five pipes made by the Companhia Brasileira de Metallurgia, each two meters (6.56 ft.) long and 15 cm. (5.9 in.) in diameter:

One pipe having walls 7 mm. (0.28 in.) thick was tested at 40 atmospheres (5880 lb. per sq. in.).

One pipe having walls 6 mm. (0.24 in.) thick was tested at 50 atmospheres (7350 lb. per sq. in.).

One pipe having walls 6 mm. (0.24 in.) thick was tested at 45 atmospheres (6615 lb. per sq. in.).

One pipe having walls 5 mm. (0.20 in.) thick was tested at 50 atmospheres (7750 lb. per sq. in.).

One pipe having walls 7 mm. (0.28 in.) thick was tested at 50 atmospheres (7350 lb. per sq. in.)

In each case no signs of sweating or leakage were observed. Higher pressures were unobtainable because of the capacity of the pump.

Important claims as to the non-corrosive properties of pipe cast by the centrifugal process are made. The tests to which such pipe have been subjected are asserted to have demonstrated categorically that they are considerably less liable to rust than pipe cast in ordinary sand molds. No explanation is offered except that its compact consistency is believed to have some effect.

Corrosion tests on the centrifugal cast pipe were made last February by the chemical laboratory of the Department of Water and Sewerage Works of Sao Paulo, Brazil, and the following is taken from the official report of Feb. 26, 1916.

Three pipes were used, two of foreign make, 25 cm. (8.75 in.) in diameter and 10 cm. (3.9 in.) diameter respectively, the third being from the "Sensaud-Arens" process, 10 cm. (3.9 in.) in diameter. They were all submitted to the action of a diluted solution of chloride of sodium (Na Cl) containing 5 grams of nitrate of ammonia. In 30 hours the foreign made pipe was covered with a layer of rust while the centrifugal cast pipe after three days

Three Hours' Output of 8-ft. 6-in. Pipe from a Centrifugal Casting Machine in Brazil. Each pipe weighs 70 kg. (154 lb.) with a wall thickness of 0.24 in.

showed no signs of rust at all. They also resisted for another 48 hours the action of hydrochloric acid diluted one to three.

THE LIFE OF A MACHINE

As to the approximate life of one of these casting machines the inventors state that it is analogous to the life of a lathe and depends on the care with which it is handled. The only part subject to wear in the revolving cylinder or mold which will need replacing after 5000 to 10,000 pipes have been cast. The cost of this cylinder is regarded as insignificant, about $20 for one incorporated in a 5 ft. 4 in. machine.

The average yearly consumption of cast iron pipe in Brazil has been normally 150,000 to 200,000 tons. It was imported mainly from England. The new Sensaud-Arens centrifugal process is expected largely to supply this demand in the future.

Two Views of the Sensaud-Arens Centrifugal Casting Machine Recently Built at Buffalo, N. Y., for Casting 4-Ft. 4-In. Pipe for Exhibition in the United States

Jobbing Foundry Installs 2-Ton Furnace

Gas Traction Foundry Company, Minneapolis, Has Small Open-Hearth Furnace Besides Gray-Iron Foundry—Design and Performance

THE remarkable growth of the steel-casting industry scarcely needs further illustration to mark its impressiveness. In the districts of long established and diversified industrial activity, steel foundry operation, both as to the size of plant and the character of equipment, is thoroughly standardized; but in those fields where the iron and steel industry is still distinctly in a developing stage and installations have in them some elements of pioneering, new undertakings have a special interest.

Our middle northwestern states have been developed industriously through the exploitation of grain, lumber and mineral products. As a market for the manufacture of iron and steel products, this territory has only recently begun to grow. About six years ago the Gas Traction Foundry Company, Minneapolis, poured its first heat in a small gray-iron foundry. Its growth as a jobbing foundry has been accentuated by a specialization in tractor castings until the company now has a daily output of from 25 to 30 tons, almost entirely of this kind of work. But the expansion of the tractor industry has brought with it the substitution in numerous instances of steel castings for iron castings, in the construction of machines, and as a logical step the Gas Traction Foundry Company has just completed a steel foundry, housed in a new building 60 x 100 ft., adjoining its iron shop. This new foundry is interesting as being the only one in a wide territory using an open-hearth furnace as a steel-making unit, and is especially noteworthy in that its furnace is the second successfully operating 2-ton McLain-Carter type of small open-hearth. This furnace is a duplicate of the first one installed in the plant of the Standard Crucible Steel Castings Company at Milwaukee. That one, since its first heat early in March of this year, has melted nearly 600 heats of metal at a rate averaging four to five daily. The Minneapolis furnace has not yet been called upon for a tonnage output requiring continuous operation,

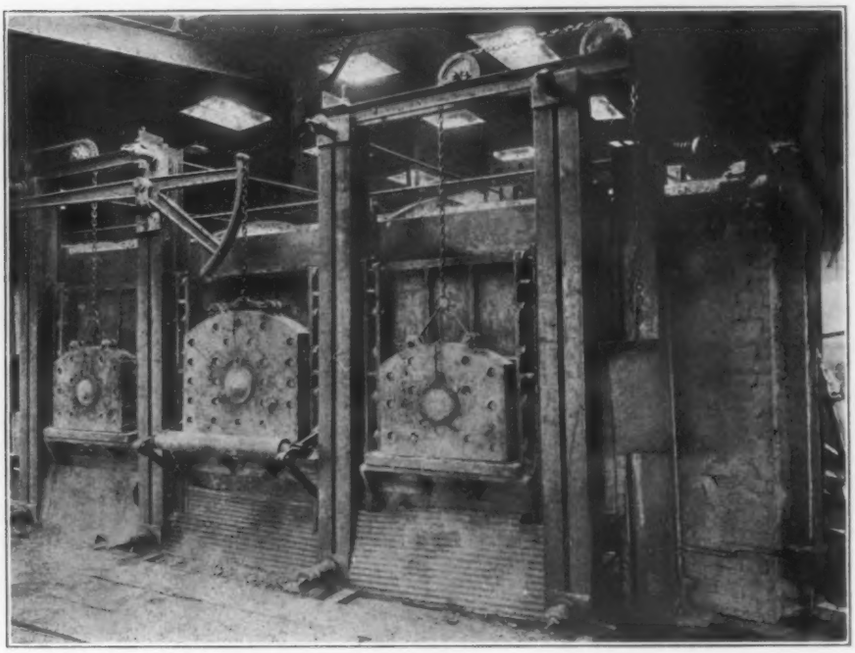


Fig. 1—Charging Side of the 2-Ton Open-Hearth Furnace Installed in the Gas Traction Foundry

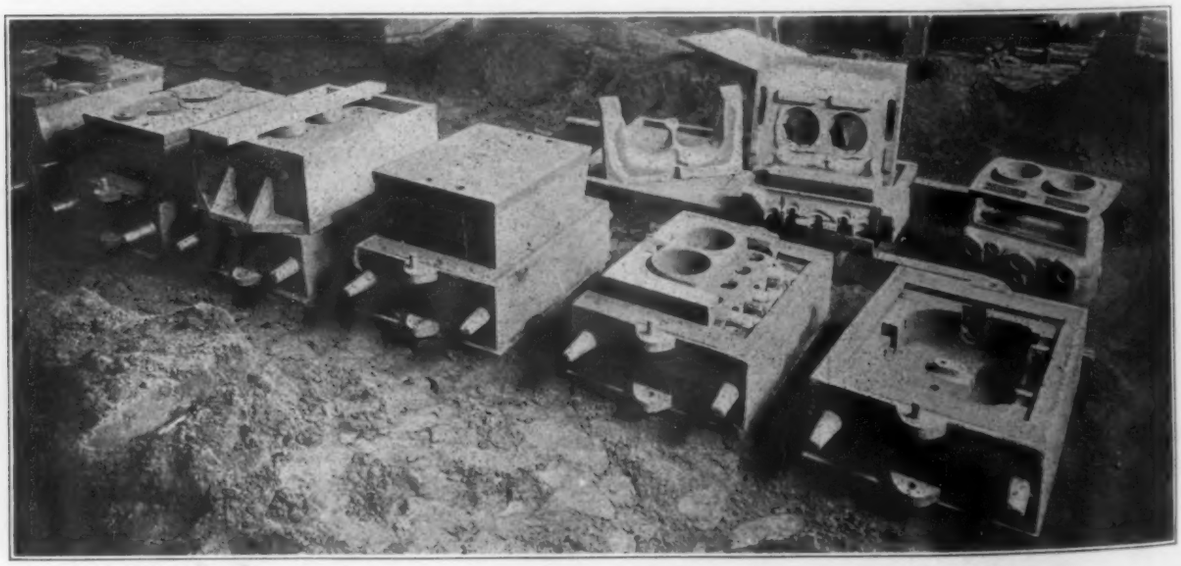


Fig. 2—Difficult Core Work in a Machine Molded Gas-Engine Cylinder Job

but since Aug. 1, when it was placed in service, two to three heats have been taken off daily.

Attempts to build open-hearth furnaces of small capacity have had but little success heretofore from the standpoint of economical production of steel. The experience in this direction is pretty well known, and the general cause of failure has arisen from the fact that the reduced areas within the smaller furnaces have subjected the lining and roof to direct flame and radiated heat action such as to break down the brick work very rapidly. The cost of relining and patching, and the interruption of operations as a result, have been the common reasons for failure. But the obvious desirability of a small melting unit in the steel foundry as attested by the wide use of the converter and the remarkable increase in the number of electric furnace installations, remained as an incentive to the design of a small open-hearth furnace, especially in view of the advantages of that type of furnace for steelmaking.

The essential consideration determining the design of the McLain-Carter type of furnace is the retention of furnace dimensions markedly in excess of the sizes as they would be, if reduced from the lines of a standard size furnace, in like proportion to the reduction in rated output. In consequence, this small furnace, rated to yield from 2 to 3 tons per heat, except for having a very shallow bath, has dimensions proportionate to a capacity at least double that at which the furnace is rated. Views of the charging and pouring sides of the Gas Traction Foundry Company's furnace are shown in the accompanying illustrations. It is a stationary type unit, the brick work being carried on I-beam girders resting on concrete piers and tied in with structural shapes in the manner indicated. It is oil-burning and the port construction is simple with easy access for cleaning. The furnace has an acid lining, which in the case of the installation at Milwaukee has served thus far for more than 580 heats without necessity of relining or unusual repairs in consequence of any internal action in the furnace.

Cross-sectional views of this small open hearth, in plan and elevation, are also here reproduced. The furnace is 35 ft. 4 in. long and 12 ft. wide. The furnace is an unusually rapid melter, the bath being obviously very shallow in view of the large ratio between the area of the furnace bed and the output, that relation being approximately 17 sq. ft. per ton of capacity, or about twice the ratio common to furnaces of larger size. The depth of the bath is 7 in., and the height to the roof arch 5 ft. The melting period from the time of charging cold scrap until the furnace is tapped is frequently as low as 1 hr. 40 min. and seldom exceeds 2 hr. A consumption of 50 gal. of oil per ton of steel melted is normal for regular operation of the furnace, and the furnace can be kept hot when not melting with an oil consumption 60 per cent less. On the basis of present prices of raw materials, these small fur-

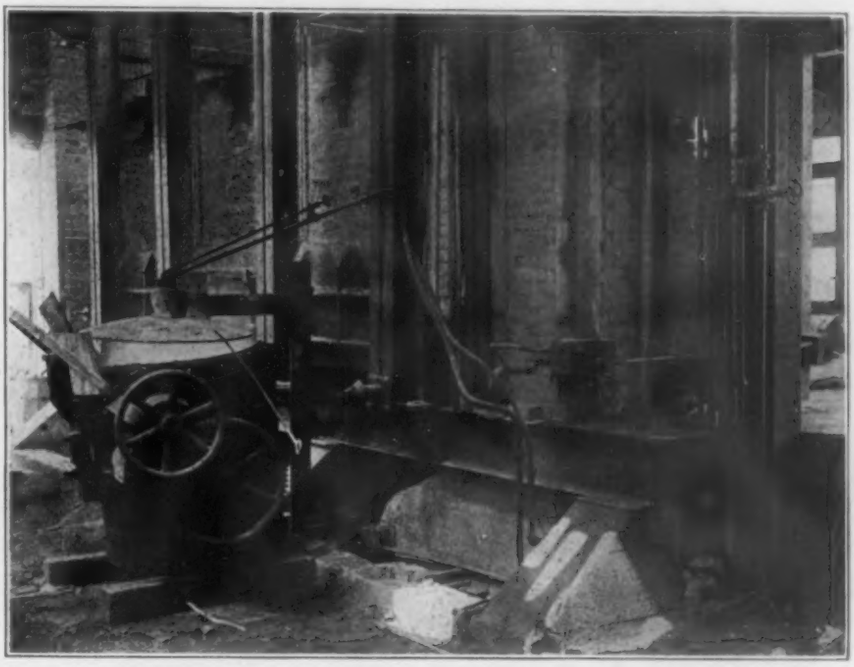


Fig. 3—Pouring Side of the Furnace, Showing Port at One End, Ladle and Oil-Burner Drying Arrangement

Fig. 4—Accurate Gear Molding in the Heavy Work Bay in the Foundry Foreground

Fig. 5—Typical Castings Poured from Steel Made in the 2-Ton Furnace

are almost entirely added in the furnace. When melting the ordinary charge of pig iron and scrap, a melting time of 45 min. ordinarily suffices, and so rapidly can the charge be poured that the addition of the ferroalloys can be made in the bath immediately preceding the pouring. In the case of titanium treatment, however, the ferrotitanium is added as the metal is poured into the ladle. A typical charge for the ordinary work, such as this foundry is making, consists of the following materials:

	Heat No. 1	Heat No. 2	Heat No. 3	Heat No. 4
Low phosphorus pig iron, lb.	630	680	600	650
Open-hearth scrap, lb.	1550	1700	1600	1550
Ferromanganese, lb.	15	15	15	15
Plate scrap, lb.	820	750	840	900
Ferrosilicon, lb.	20	20	20	20
Total, lb.	3035	3165	3075	3135

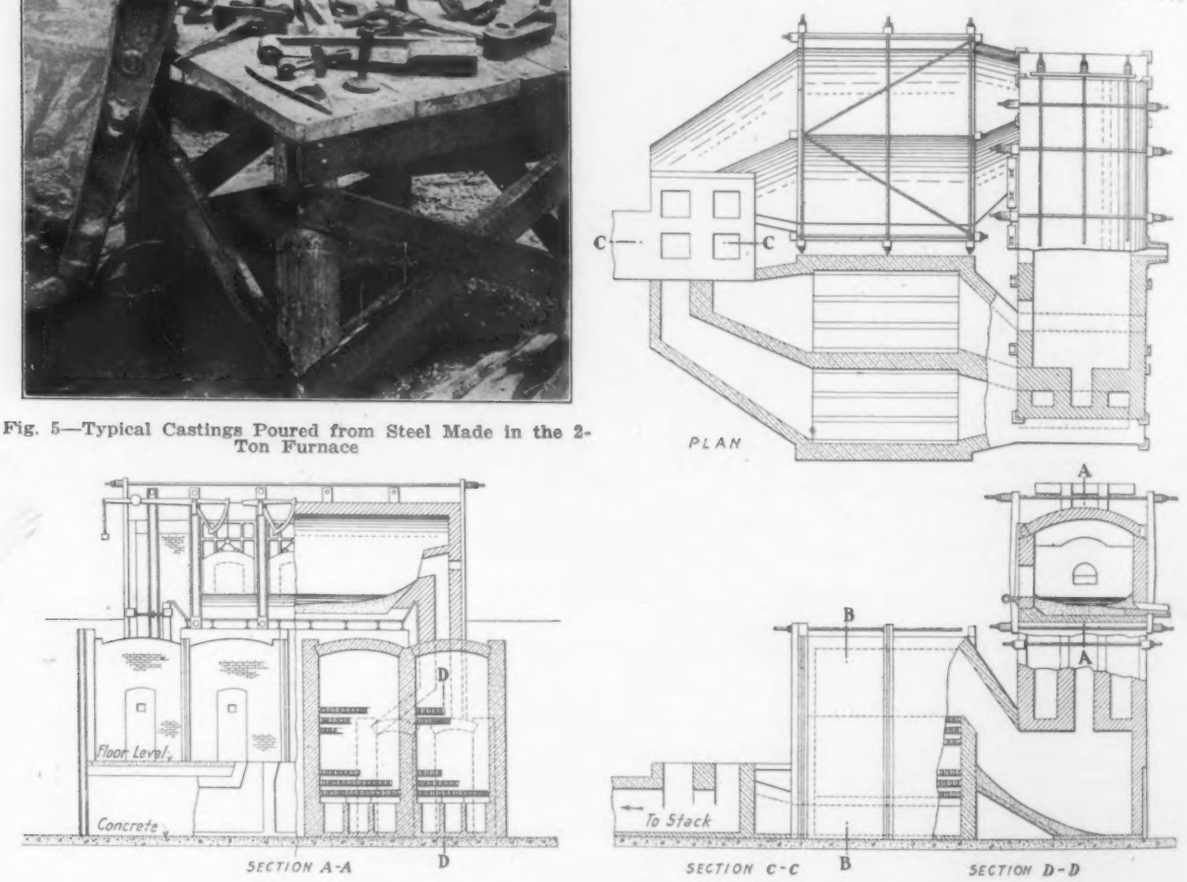


Fig. 6—Cross-Sectional Plan and Elevation of McLain-Carter Open-Hearth Furnace

naces are producing steel at a cost of less than $30 per ton.

The oil burners, which are of simple construction, to permit ready replacement if burned off, consist chiefly of a wrought steel pipe flattened at the tip. They are inserted at the ends of the furnace in the ordinary manner, burning at either end in alternation with the reversing periods of 15 to 20 min. In the design of the regenerative chambers and checker work, the same principle of liberal sizes is applied, these chambers having capacity ample for a much larger unit. An idea of their overall size may be gained from the fact that the concrete pit in which they are built has dimensions 25 ft. x 39 ft. 8 in. The gas value is of the ordinary water-sealed butterfly type with a special precaution against freezing of the water line secured by circulating the water through a coil in the jacket of the furnace stack. The stack has an inside diameter of 42 in. and is 85 ft. high.

The melting practice in this small furnace differs from that of larger units chiefly in the rapidity with which the stock is melted down, the shortening of the period of refining and the fact that ferroalloys

From charges of the above character heats of the following analyses have been regularly obtained:

	Per cent	Per cent
Carbon	0.18	0.235
Silicon	0.26	0.32
Sulphur	0.05	0.053
Phosphorus	0.035	0.035
Manganese	0.34	0.63

That the metal produced is of a satisfactory character for a wide range of castings is indicated from the illustration shown in Fig. 5, all of the pieces shown having been cast from the first several heats taken from the furnace. A very hot metal can be had when desired for thin sections and the furnace characteristics lend themselves to an easy control of the metal to supply all ordinary requirements of a varied class of castings. The hot metal from this furnace is handled as indicated in the view of the pouring side of the furnace in a bottom-pour ladle of approximately 6000 lb. capacity.

In the gray iron foundry the work ranges from small snap-flask jobs to castings weighing several hundred pounds. Typical of the work that this company is doing on squeezer molding machines is the cylinder job shown in Fig. 2. Specifications for this

cylinder require exact clearances, and the setting of the cores in the mold, of which there are 29, calls for exceptional accuracy. In the illustration there is shown, on the fourth mold at the right, a wood templet cheek which is located on the drag flash by means of the pins and from which the principal cores are centered. The mold is poured without a flask for the cope, the upper section of the mold being entirely in cores. Skim gates of the kind shown in illustration are used, the metal being trapped in the flat covers shown in place on one of the molds. A molder and helper put up 30 of these molds per day. The finished steel casting weighs 112 lb.

Some of the larger work cast is illustrated in Fig. 4, the piece being a gear for a tractor, the gear having a diameter of 4 ft. 6 in. and weighing 283 lb. It is required to be cast true within 3/32 in., the teeth of the gear to be clean and accurate so that no subsequent machining is necessary.

The designers of the 2-ton furnace are David McLain, Goldsmith Building, Milwaukee, and Frank Carter, now associated with the Gas Traction Foundry Company, Minneapolis.

Plant for Making Electric Vacuum Cleaners

Shop of Frantz Premier Company, Cleveland — Interesting Equipment Details — Foundry Methods for Making Difficult Aluminum Castings

ONE of the manufacturing industries that have developed rapidly during the past few years is the making of portable electric vacuum cleaners. One of the largest companies in this field is the Frantz Premier Company, Cleveland, which recently moved into a new four-story plant, 320 ft. long and 60 ft. wide, all of which is devoted to the manufacture of the cleaners. All of the metal parts, including the small motors that drive the suction fans, are made in this plant. A narrow wing extends from one side of the building, near the front, this to be a connection section when growth warrants the erection of another unit a duplicate in size of the present one. The toilet rooms are located at one side of this wing, and a wide aisle will provide for trucking between the floors of the adjoining buildings when the second unit is built.

Virtually as a part of this plant, but occupying an adjoining building, and operated by a different but allied company, the Premier Aluminum Foundry Company, is an aluminum and brass foundry. This makes the aluminum castings for the cleaner, which are the principal product of the foundry.

The manufacturing plant represents the modern type of factory construction. The building is of brick, steel, and reinforced-concrete fireproof con-

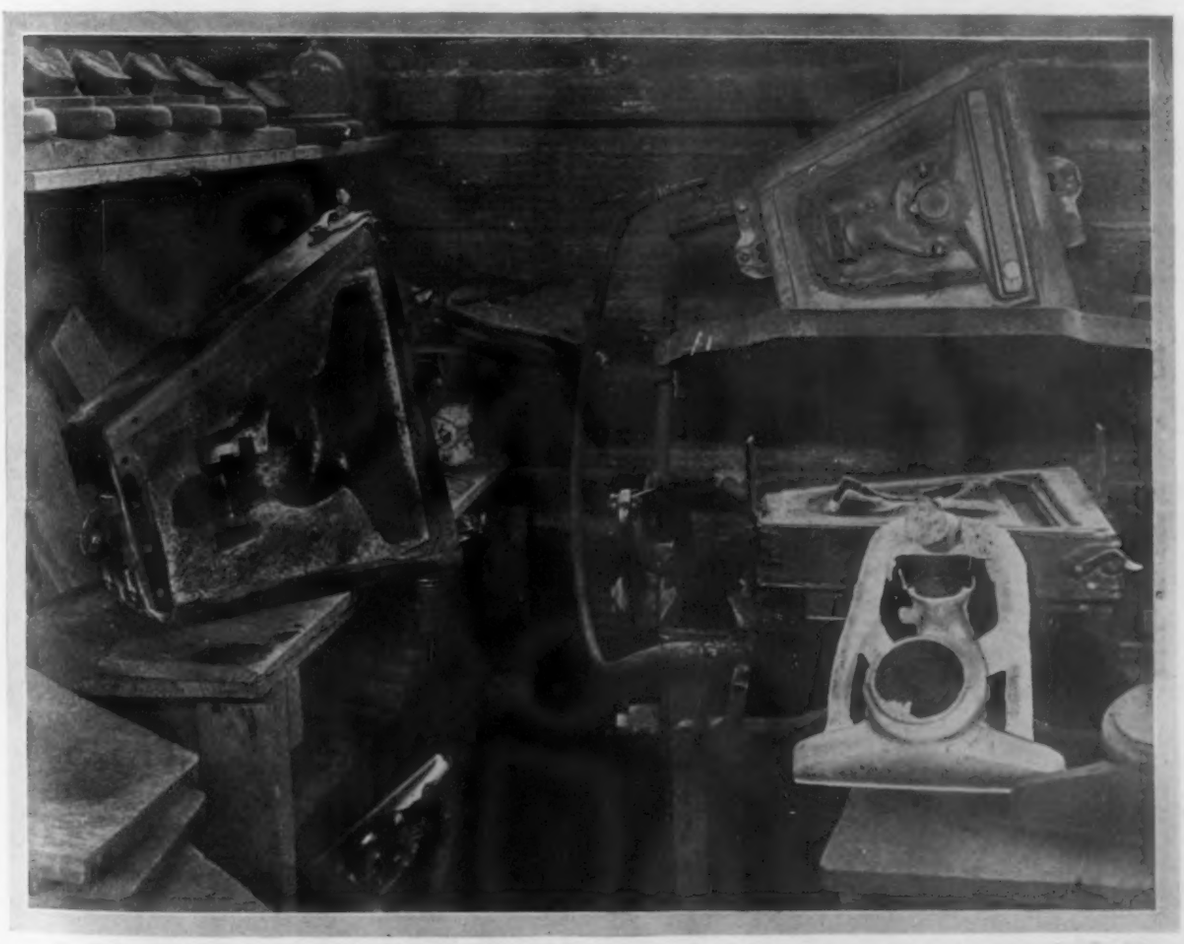


Fig. 1—The Bottom or Main Body Casting As It Comes from the Mold and Cope and Drag and Matched Plate Pattern. At the extreme lower right hand corner half of two large cores for this mold are shown

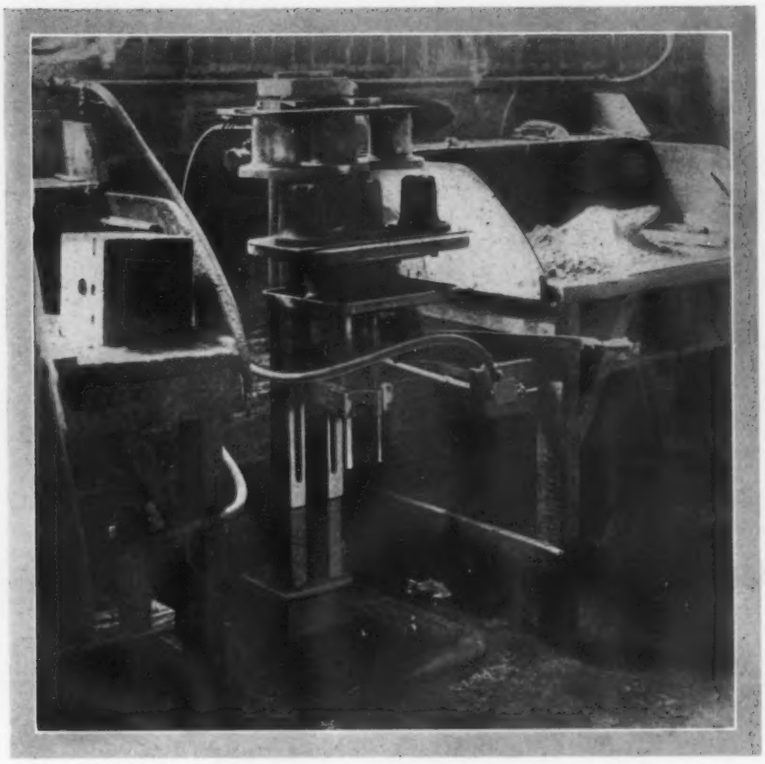


Fig. 2—Unique Core Drawing Machine Found Particularly Efficient in Drawing Long Cores. Mounted on the machine are three core boxes and motor cap cores requiring a 5-in. draw

struction, with an abundance of window surface on all sides, the window glass being fitted into steel sash. The plant is arranged to meet the special requirements of the industry and for the economical manufacture of the product; the various departments are laid out for the convenient routing of material in process of manufacture and assembling.

The various manufacturing processes require the use of considerable machinery and other equipment of varied character, including automatic machines, screw machines, punch presses, polishing and buffing machinery, electric welders, and baking ovens. Various improvements have recently been developed in some of the manufacturing processes to improve the product and cut down the cost of production. The Taylor system of management is being carried out in the plant, and operations are directed from the planning department on the second floor, adjoining the general offices.

Interesting methods are employed in the foundry making some of the aluminum castings. The three principal castings used in the cleaner comprise the bottom or main body part, which contains a nozzle that passes over the surface that is to be cleaned; the motor base, and the motor cap or case, the last a cylinder about 5 in. in diameter, rounded over at the enclosed end. There are several smaller castings used as parts of attachments. All molds are made with green sand and all cores with dry sand. The bottom casting is the most difficult to make, owing to its peculiar shape and thin section, being only 3/32 in. in thickness, and to the large cores required.

The mold for the bottom casting is made on Farwell 32-in. hand squeezers, in wooden snap flasks tapered from end to end to conform to the general outline of the mold, and thus to reduce the quantity

Fig. 3—Automatic and Screw Machine Department, Showing the Shafting and Counter-Shafting Placed Parallel to the Machines or at an Angle with the Building

of sand required. The flask is 16 in. long on two sides, 16½ in. on the third, and 8 in. on the side or end opposite the third. The cope is 5 in. in depth and the drag is 3½ in. deep. The pattern is a double match plate made of aluminum. After the mold is removed from the flask a tapered wooden jacket is placed around it. Formerly, much difficulty was experienced in producing these castings free from pin holes. This has been avoided by providing a more equal distribution of metal by having four gates instead of one, these gates being connected to one sprue hole and reaching the mold at the parting line, as shown in view of the method of molding.

Two large cores are required in making the bottom—a nozzle core and a fan core. The nozzle core is set in the mold, and the fan core rests on the nozzle core, on a 1½-in. print in the center and on the mold on one side. These cores are made by hand in bronze core boxes. Owing to the extreme thinness of the casting, much care is required to secure the proper shrinkage allowance for the core boxes. This shrinkage is insufficient in iron core boxes. For that reason bronze core boxes are used, the composition being 85 per cent copper and 15 per cent tin. The lasting qualities of these core boxes are indicated by the statement that one bronze core box can be used for making 40,000 cores.

The cores are drawn on a core-drawing machine that has been fitted up from an old drilling machine from which the head has been removed. A jaw is provided for holding the core box while the core is being drawn. The core-drawing device is said to have proved particularly efficient in drawing cores for the motor caps requiring a 5-in. straight draw, in which there are four small ribs. By mechanically drawing the core, no patching is required on the cores after drawing, and by eliminating patch-

Fig. 4—The Polishing and Buffing Department Has Such an Effective Exhaust System so That it is Not Necessary to Partition This Department from the Other Manufacturing Departments on the First Floor. One of the exhaust fans is shown suspended from the ceiling in the background

Fig. 5—Armature and Field Winding Department with Semi-Indirect Lighting. Location of open window sections for ventilation is shown and the electric baking oven appears along the wall at the left

ing the machine is said to save fully 50 per cent in the time of drawing cores.

Cast-iron driers are used for the bottom cores, and the other cores have a shape that requires the use of drier boxes. The cores are baked from 45 to 60 minutes.

The motor base and cap molds and smaller parts are made on an Arcade Modern roll-over pattern drawing and Osborn direct-draw roll-over jolt molding machines with brass patterns mounted on iron plates. Six motor caps are poured from one gate, one chill, to prevent cracking, being set at the top of the cap mold forming the hub where the metal is thicker. Miscellaneous small cores are made on a Hewlett-Demmler core machine, and this machine will be used shortly for making the larger cores for the bottom casting. The small core boxes are cast iron. The core sand is mixed by means of a Blystone core sand mixer.

The melting equipment includes seven gas-burning Buckeye pot furnaces with a capacity of 60, 80, 100 and 125 lb. per heat, the largest pots being used for aluminum and the smaller for brass.

The finished castings, after being cleaned, chipped and inspected at the foundry, are sent to the Cleaner Company's factory, where, after various machine operations, they are polished and buffed and are ready for assembling. The machining of the inside of the motor case is the most interesting machine work on the casing. In one setting the case is faced and four ribs on the inside of the case are drilled, the hole is drilled and reamed in the hub for the bronze bushing, and the bushing is pressed in with a turret tool and bored and reamed. These operations are performed on a Warner & Swasey turret lathe, at the rate of 40 an hour, the work being held during the various operations in a special automatic chuck.

The polishing and buffing department is so arranged that the work passes from one machine to another in regular order of operations, first to the rough polishing machines, then to the finished polishing machines, and finally to the buffing machines. Webster & Perks double-headed polishing machines are used. An interesting feature of the polishing department is that the exhaust system is so effective that it is not found necessary to partition this room off from the other departments, this occupying a section of the first floor near the machine shop. Two exhaust fans suspended from the ceiling on brackets are provided, one for the ten double end-polishing machine and the other for the buffing machine, each driven by a 20-hp. motor. The exhaust from each unit is carried out through the side wall and above the roof. The exhaust system is furnished by the Ohio Blower Company.

The fan of the vacuum cleaner, which was formerly a casting, is now made of steel stampings. It consists of a circular disk 4½ in. in diameter, with a flange, and on the opposite side of this disk are attached seven ⅝-in. blades, each of the blades being spot-welded to the body. Three weldings are used for each blade and seven weldings for the small reinforcing blade that is attached to the hub. The welding is done with a Toledo spot welder, and one operator can weld 500 fans in a day.

The handle arm or fork consists of two steel stampings spot-welded together, and the handle ferrule is spot-welded to the fork. The fans are spray painted by means of the Aeron System, equipment for which was furnished by the DeVilbiss Mfg. Company, Toledo, Ohio. After painting, the fans are baked in an electric oven.

An electrically heated oven has taken the place of the former steam-heated oven for baking varnish on armatures and for baking enameled and painted parts. These parts are baked for 11 hr. at a temperature of 185 deg. Fahr. In order to keep the air in the oven in circulation, thus providing an even temperature, a small fan is located at the side of the oven. This oven was furnished by the Young Brothers Company, Detroit.

An interesting feature of the automatic and screw-machine department is that the line and countershafting, instead of being parallel to the axis of the building, are placed parallel to the machines, or at an angle of 15 deg., thus eliminating twisted belts and belt troubles. Wagner B. W-type motors, located overhead, are used throughout the plant, and the machinery is driven in groups by 20, 10 and 5-hp. motors. The motors are equipped with the Sundh electric switch type of magnetic control, and the control of all the motors is from the switchboard in the planning department, which is the heart of the shop; and the motors are started and stopped by this department. If the motor is shut down through the day on account of a break it cannot be started except by the planning department, so this department cannot escape notification when something is wrong. A 20-hp. motor, with pulleys, is kept in reserve, to be placed in any desired location on the floor for use should any motor give out. It is stated that this motor can be located and put into operation within 15 min. and give the same pulley speed as the disabled motor did, so that men doing piecework will suffer no serious inconvenience.

The lighting of the plant represents up-to-date practice. All lighting is overhead, general lighting with lamps, mostly of 100-watts capacity, equipped with standard reflectors, so that no local lighting with drop cords to machines need be required. An unusual application is found in the semi-indirect lighting, which is seldom adopted for factory purposes because this lighting, to be satisfactory, requires white ceilings. The semi-indirect lighting is used in the armature-winding department, where the work calls for a uniform distribution of light and elimination of shadows, and it is found to be very satisfactory. Because of the nature of the work in this department, and the location of the plant at the outskirts of the city away from the large manufacturing center, the ceiling in this department can be kept white without frequent repainting.

A departure from the usual arrangement of open window sections is found in this plant. There are three continuous window sections between the curtain walls. The lower windows of the two outer sections and the upper windows of the center section are hinged, providing openings for ventilation both near the floor and close to the ceiling, and permitting a very free circulation of air during the warm weather when the windows are all open.

Youngstown Iron & Steel Company's Additions

The Youngstown Iron & Steel Company, Youngstown, Ohio, which but recently completed its steel plant containing three 75-ton open-hearth furnaces, illustrated in THE IRON AGE of Feb. 24, has decided to add at once another furnace of the same size, also one 4-hole soaking pit, a gas-producer plant, and a crane runway 80 x 400 ft. It will then have a monthly capacity of close to 20,000 tons of ingots. These will be rolled into sheet bars, to be used in the company's sheet and other finishing mills. These extensions will cost close to $500,000. When the gas-producer plant is finished the company will dispense with the use of natural gas. The Fort Pitt Bridge Works, Pittsburgh, has the contract for the structural steel, and the Culbertson Construction Company will do the excavating.

The Grönwall-Dixon Electric Furnace

Results in a Year's Operations in the Production of Special Alloy and Carbon Steel Billets—Cost and Electrical Data

THERE has been in successful operation in Detroit for over a year an electric steel furnace with which the electric steel industry of the United State as a whole is but little acquainted. It is now known as the Grönwall-Dixon electric melting and refining furnace, and is operated by the John A. Crowley Company of New York and Detroit.

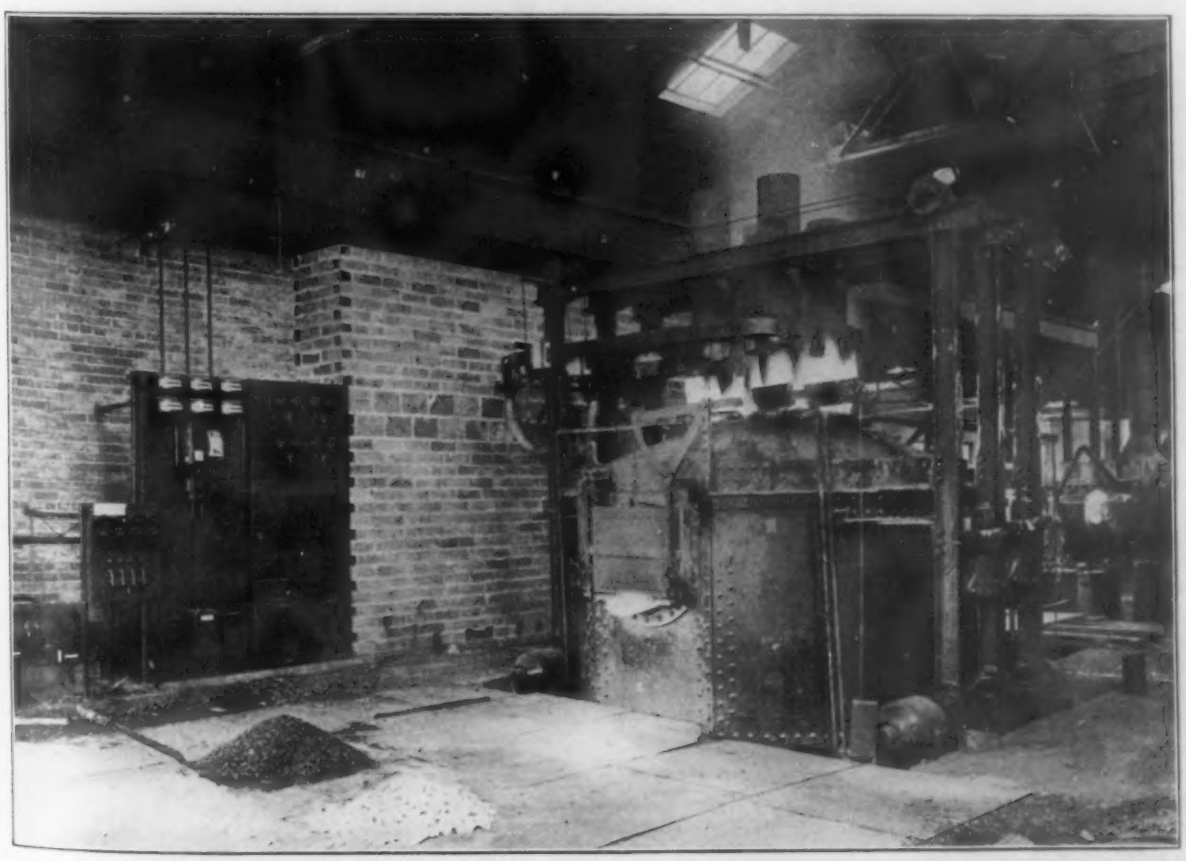
ORIGIN OF THE FURNACE.

When first introduced in this country, it was called the Grönwall furnace, but because of certain American patents secured by Joseph L. Dixon of the John A. Crowley Company the name was recently changed. While the Detroit installation is the only one commercially operating at present in this country, sales of several others have been arranged, and there were twelve in England and two in other countries operating or contracted for on Jan. 1, 1916, according to the review of the electrical steel industry published in THE IRON AGE of Jan. 6, 1916. But in Europe the furnace has been more familiarly known as the Electro-Metals furnace, as put out by the Electro-Metals Company, Ltd., of London, with which Mr. Dixon, a metallurgist and electrical engineer, was once associated. Essentially, however, the furnace is of Swedish invention.

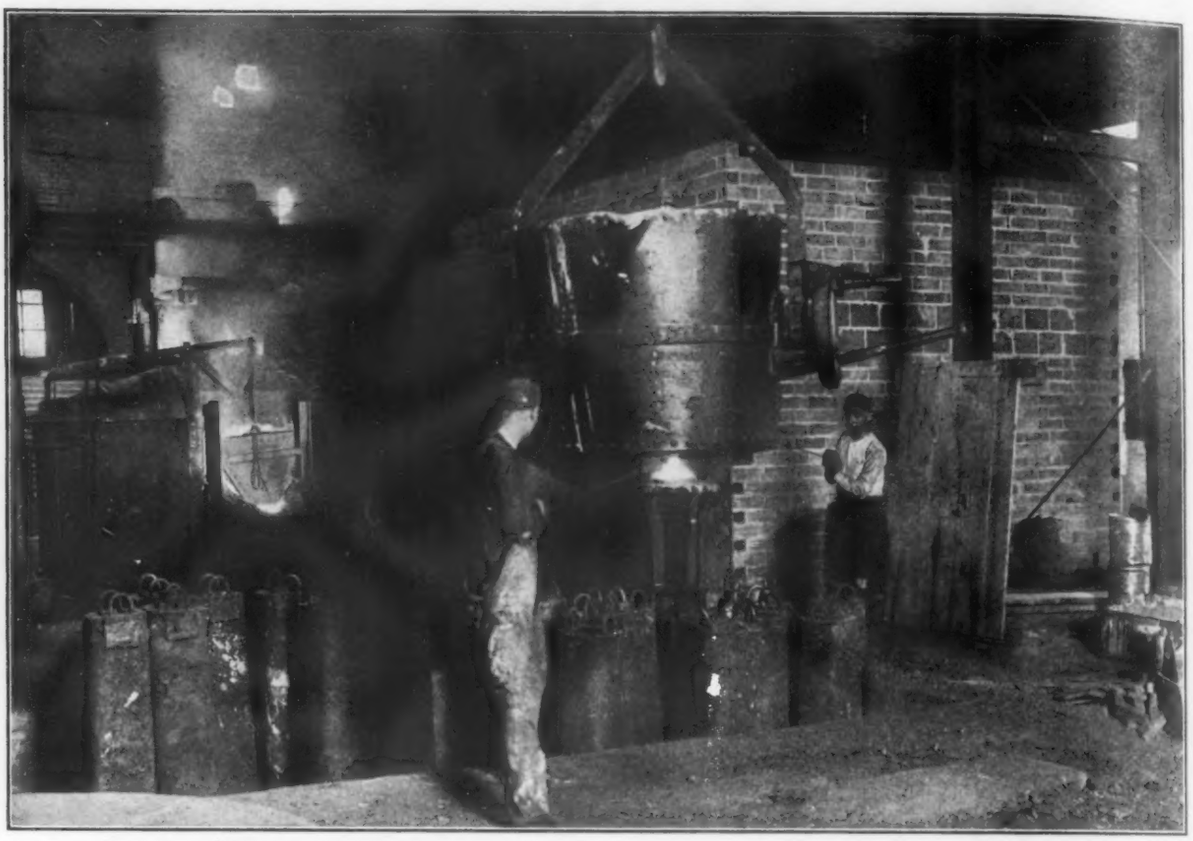
Early in 1915 John A. Crowley, president of the company, returned from England after having concluded negotiations for the representation of the furnace in the United States and Canada. At that time it was better known here in connection with the ore smelting furnace of the same name used in smelting Swedish ores in Sweden. After careful investigation of a location arising from a decision to operate the furnace commercially in this country producing high-grade alloy and carbon steels, Detroit was selected. That city was regarded as offering the double advantage of a good market for the product of the furnace and a source of desirable and varied scrap.

Arrangements were concluded with the Railway Steel Spring Company, whereby at one end of its plant a 5-ton furnace was installed, with a provision that the billets of various steels be rolled into finished shapes by the same company. The first heat was taken out July 25, 1915, since which time there has been almost uninterrupted successful operation. On Aug. 18, 842 heats had been poured and incorporated into various sizes of billets.

The furnace at Detroit is cylindrical in shape. It is tilted by the usual worm-driven connecting rods operated by a motor drive through a reversing controller. The silica brick roof is constructed in a supporting steel ring made in halves, and is



The Grönwall-Dixon Electric Melting and Refining Furnace at Detroit as It Appears When Operating. Its Capacity Is 5 Tons



Pouring a 5-Ton Heat Into Bottom-Poured Ingots from the Grönwall-Dixon Installation at Detroit, Mich.

removable and replaceable by a spare one. Such a roof, it is stated, is capable of lasting 75 or more heats, but is usually replaced every two weeks. The assertion that a roof so constructed is weakened by the four holes for the electrodes is not borne out by experience, as after more than 50 heats it easily withstood the weight of two or three men.

THE ELECTRICAL ARRANGEMENTS

The furnace has two doors, front and back, the front being a combination pouring and charging door by using a removable spout. The use of two doors instead of three is considered an advantage. The electrodes are carried by an overhead support of beams, their weight being counterbalanced with a mechanical gearing for the control attached. An individual motor for each electrode operates this control, and they are energized through a system of contractors, located on the switchboard. The amount of current to be passed through each electrode can be set at a number of different steps by the operator, the current being so maintained by an automatic control. Indicating instruments for current and voltage in each electrode are also under the immediate observation of the operator. The operation of one to four furnaces can be readily watched by one melter and his assistant by locating all the levers for operating the switches on one panel.

This furnace differs from most of those operating at present in the United States, in that it uses two-phase current and four electrodes through the roof with a neutral one in the hearth. Though operating on a two-phase system, a three-phase supply is taken through two banks of transformers and changed to two-phase by a modified Scott three-phase to two-phase connection. Four vertical electrodes pass through the roof in furnaces of five or more tons capacity. In smaller ones, two such electrodes are recommended. The bottom electrode, which is of carbon and not of metal nor water-cooled, is protected from the molten metal by being imbedded under the hearth's lining.

The transformers are arranged so as to deliver a current of variable voltage. Each phase of the two-phase current is carried to a pair of the vertical electrodes, the bottom one being joined to the neutral point of the transformers, and hence called the neutral electrode. The two-phase current takes a perfectly balanced load from the three-phase supply mains.

The principal advantages claimed for the Grönwall-Dixon furnace are:

Ease with which a large power input can be used in melting down cold charges.

The facility with which the melted metal can be agitated when refining by the influence of the neutral electrode in creating a magnetic movement of the bath, insuring more complete mixing.

The arcs can be thrown in series by means of a special arrangement of switches, in which case the bottom electrode carries the unbalanced load; or when thrown in parallel the bottom electrode serves as a common return. Operation can also be conducted in several intermediate positions between series and parallel. For this arrangement it is urged that when melting on a cold charge or bottom when the resistance is high, rapidity of operation can be secured with the added economical advantage that large power input through a long arc of high voltage can be used without a waste of energy by passing large currents through the bottom.

Later this voltage can be reduced when refining, recarburizing, etc., by shortening the arc and thus decreasing decidedly the reflected heat on the walls and roof, which, of course, lowers the cost per ton of metal. Either the parallel or one of the modified connections is used with the short arc, the current passing through the bath to the bottom electrode; thus the proportion used is capable

of being varied to almost any extent. This electrical system affords power companies a desirable load, effecting a transformer efficiency of over 98 per cent, with the service mains and power station undisturbed by any serious surges, the minor ones that take place during melting being absorbed by the interlocking of the phases by the transformers. The power factor is reported as 90 to 95 per cent.

THE GRADES OF STEEL MADE.

All grades of scrap are used—from high sulphur and phosphorus bolts, nuts and plate to nickel and alloy steel turnings. The furnace operates basic and is continuous. The more than 900 heats already made have included high and low carbon nickel steels, chrome-nickel steels, chrome-vanadium steels and high silicon and high manganese steels as well as any grade of plain carbon steel.

The high and low carbon nickel steels average 3 to 3.50 per cent in nickel. The high and low carbon nickel-chrome steels have contained 0.25 to 0.35 per cent carbon for the low and 0.50 to 0.60 per cent carbon for the high, with the nickel about 1.50 per cent and the chromium about 0.75 to 1 per cent. The low carbon steels have been especially employed for case-hardening. The chrome-vanadium steels have been made to contain on the average about 1 per cent chromium and 0.18 per cent vanadium. Special variations from these have been supplied. Most of these steels are being consumed by automobile and aeroplane builders.

Each heat is reported to average from 4 to 5 hr., with an energy consumption of 550 to 600 kw. hr. per ton. Three hours is reported as the minimum under favorable conditions for some heats, averaging under 0.02 per cent sulphur and phosphorus with a consumption of only 460 kw.-hr. per ton.

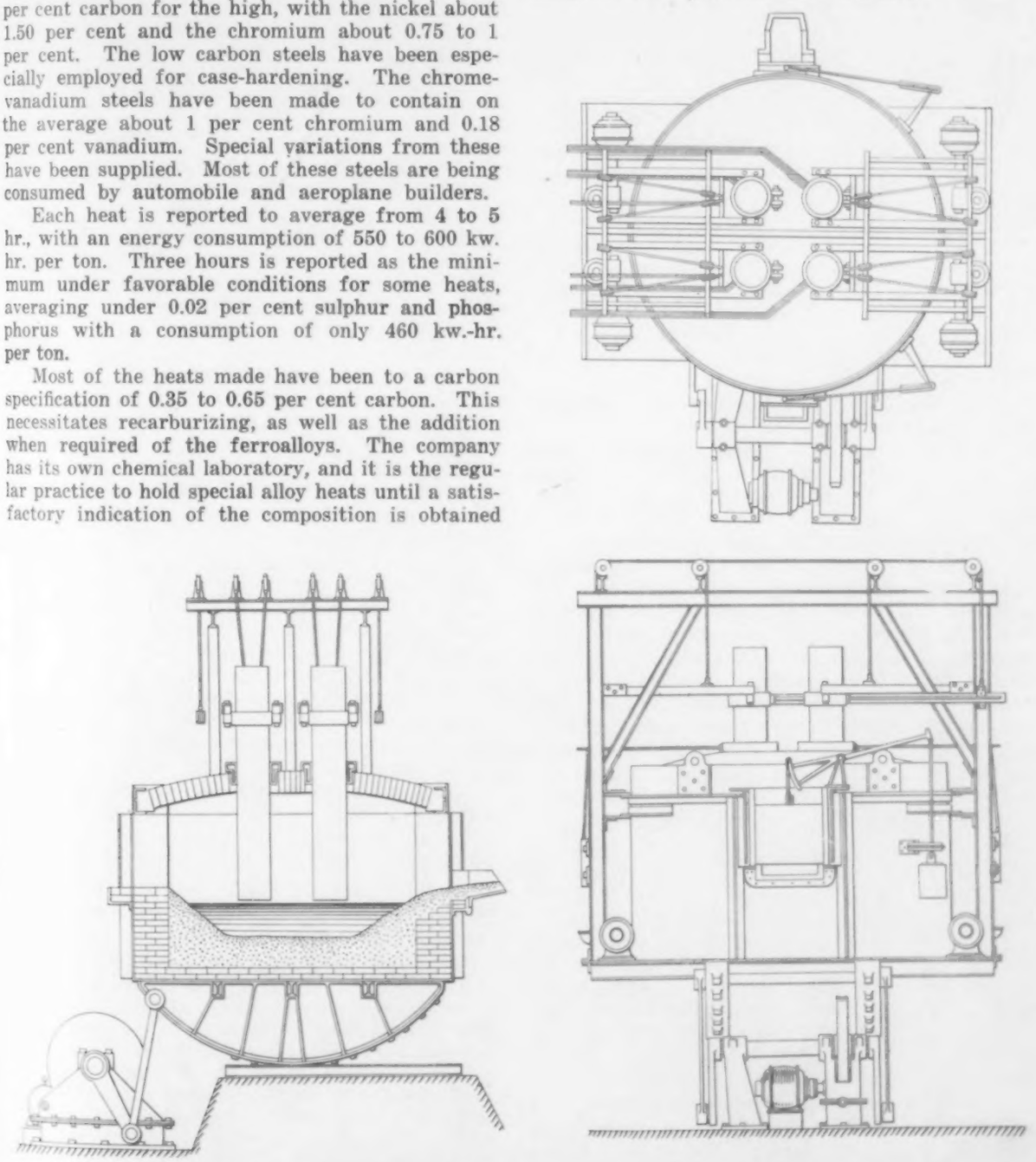
Most of the heats made have been to a carbon specification of 0.35 to 0.65 per cent carbon. This necessitates recarburizing, as well as the addition when required of the ferroalloys. The company has its own chemical laboratory, and it is the regular practice to hold special alloy heats until a satisfactory indication of the composition is obtained from the chemists so as to meet the exacting specifications.

TREATING MANGANESE SCRAP AND CUPOLA METAL.

The advantage of the electric furnace in general and this one in particular was recently demonstrated by several very interesting experimental heats made for a company interested in reclaiming its high manganese steel scrap. The scrap, which showed a manganese content of 12 to 13 per cent, was charged alone into the furnace. After complete melting, samples revealed the fact that the average manganese loss was slightly less than 0.75 per cent, which is decidedly less than the company had ever been able to secure by any other furnace or process.

Still another interesting experiment carried out at Detroit, and which is regarded as suggesting a field for such a furnace, is the electric refining of cupola metal. Encouraging results were achieved somewhat as follows:

Fluid cupola metal of the following analysis was charged into the Grönwall-Dixon furnace:



Sections and Plan of a 10-Ton Grönwall-Dixon Electric Furnace, Showing Construction and Electrical Connections

	Per Cent		Per Cent
Carbon, combined	0.63	Manganese	0.73
Carbon, graphitic	2.65	Phosphorus	0.313
Silicon	1.980	Sulphur	0.044

The metal was refined in the usual way and from it a 1-in. square test bar was cast. Physical tests of this bar were as follows:

Supported on knife edges 12-in. apart, it sustained a load, applied in the middle, of 3050 lb. before breaking, the deflection being 0.215 in. The tensile strength was 27,570 lb. per sq. in. and the Brinell hardness 202.

This experiment is reported as a sample of many excellent ones. While thus far it has been only experimental, it is believed by the company that the commercial field is wide.

COST OF THE STEEL.

The cost of producing a ton of liquid alloy steel or steel castings, refined to 0.025 per cent or under of phosphorus and sulphur, based on a year's operation of this 5-ton furnace, is given as follows:

	Liquid Alloy Steel	Steel Castings
Electric energy, 550 kw.-hr., at 8c.	$4.40 (500 kw.-hr.)	$4.00
Electrodes, 20 lb., at 5½c. per lb.	1.10	1.10
Refractories	0.40	0.40
Alloys	0.61	0.61
Slag mixture: 60 lb. lime per ton of steel; 6 lb. fluor spar per ton of steel; 10 lb. of coal per ton of steel	0.25	0.35
Scrap and iron	14.00	12.00
Skilled labor	0.70	0.60
Unskilled labor	0.30	0.12
Total	$21.76	$19.18

About 5 lb. of standard ferromanganese per ton of steel are found to be necessary to raise the steel from a minimum of 0.30 to 0.40 per cent manganese to the desired content. About 6 lb. of 50 per cent ferrosilicon per ton of steel are added to bring the steel to 0.15 per cent silicon. The estimated cost is 43c. for the manganese and 18c. for the silicon. Special alloys for special steel are extra.

The cost figures are based on the making of high-grade alloy steels to meet severe specifications, and it is emphasized that in producing steel castings these costs can be decidedly reduced because of no necessity to analyze the metal before tapping.

The experience of the operations thus far has demonstrated that it is unnecessary to use any deoxidizing agents, such as ferromanganese or ferrosilicon, except such as needed to meet specifications. It has been possible to add most of the desired alloys as scrap, or as soon as the charge was melted, and in some cases no manganese or silicon was at all necessary, demonstrating the non-oxidizing nature of the furnace operations. Absolute uniformity is reported as characterizing all steels made.

THE LIFE OF THE BOTTOM.

The duration of the original basic bottom is pointed to as noteworthy. It is still intact and in good condition after nearly thirteen months of constant use. This is attributed to the influence of the passage of the current through the hearth.

All ingots are bottom poured and weigh about 400 lbs. each. There has been very little evidence of segregation even in piped ingots, and there has been no difficulty in refining down to 0.01 per cent sulphur from a initial content of 0.10 per cent. These results are ascribed in part to the effect of the bottom electrode, which causes the current to pass through the metal, overcoming a tendency of the arcs to skim over the surface and causing an unusually high temperature. The same influence is claimed to have been responsible for the fact that there have thus far been no cold rings nor chilled bottoms in the furnace.

An interesting set of investigations is being conducted at present by the Detroit Edison Company of Detroit on certain electrical phenomena and other conditions arising from the application of electric current to such operations. In addition some special heats are being made of ferro-carbon-titanium-treated steel for incorporation in boiler tubes for use by the same company. The metallurgical phase of this is being investigated by the metallurgical department of the University of Michigan under Professor White.

The John A. Crowley Company has already completed plans for building a new plant of its own, situated in the western section of Detroit. It will have a 10-ton Grönwall-Dixon furnace, now under consideration, and all facilities for rolling its billets into desired shapes. Later the present 5-ton furnace will be removed to the new plant. A complete modern plant, capable of expansion, will be the result. It is the belief of the promoters of this furnace that the large electric furnace unit as a successful competitor with the open-hearth is a development to be confidently expected.

Engineering Service Plus Machine Building

(*Continued from page* 504)

to be made, some molds containing more than one. From these cards, on which the molder's finishing time is later recorded, the first information is then obtained for making up the daily heat report sheet. The remaining data are obtained when the castings have gone through the cleaning room, passed inspection and are ready for delivery. Here the weights and number of good castings are recorded. A copy of this heat report then goes to the foundry clerk.

The patterns when they are returned by the molder at the completion of the job are loaded on a large multiple shelf truck for return to the storage rooms. Before taking them back the pattern keeper checks each pattern against the heat report for shortages as the result of defective castings or miscount. Where a shortage in the number of castings is found a green tag is attached to the pattern and it is returned to the temporary storage shelves, where the foreman distributing the work can promptly send it out to the foundry, thus preventing an accumulation of shortages and a resultant delay in filling orders for the lack of a few pieces. In the case of both the white and the green pattern tags, a detachable coupon provides for the making of the necessary cores. From the heat sheets a further card index record, filed according to order numbers, is kept, each card showing a continuous record of the number of castings made each day against an order with the remainder still to come.

Powdered Coal Under Steam Boilers at Parsons, Kansas

What is believed to be the first large installation of pulverized-coal burning under a complete battery of stationary steam boilers has been in operation since Aug. 1 at the shops of the Missouri, Kansas & Texas Railroad, at Parsons, Kan. There are eight 250-hp. O'Brien water-tube boilers, and an evaporation of 10.7 lb. of water from and at 212 deg. Fahr. per pound of combustible was obtained, with 16 per cent carbon dioxide in the stacks. The plant was designed and installed by the Fuller Engineering Company, Allentown, Pa.

Foundrymen's Conventions at Cleveland

Iron, Steel and Non-Ferrous Foundry Meetings and Foundry and Machinery Exhibition Next Week

R. A. Bull, President, A. F. A.

FOUNDRY week this year will be held in Cleveland. It will begin Monday, Sept. 11, and close on Saturday, Sept. 16. As usual, the American Foundrymen's Association, devoted to iron and steel subjects, will hold joint sessions and also independent simultaneous sessions with the American Institute of Metals, the organization concerning itself with non-ferrous problems. This year, however, will mark for the first time the joint management by the two associations of the exhibition of foundry equipment and supplies and of machinery and accessories formerly conducted by an independent corporation. Another departure is noted in that the programs provide for one meeting per day, thus allowing better arrangements than formerly for the inspection of the exhibits and for the participation in plant visitations and entertainment features.

The technical program of the American Foundrymen's Association is announced as the most elaborate and complete in the history of that organization. It contains 40 papers and addresses and 11 committee reports. The completeness of the program of the American Institute of Metals is also noteworthy, containing 21 papers on brass foundry and rolling mill work. The number of contributions on iron and steel requires simultaneous sessions; on Thursday, on steel and malleable casting work, and on Friday, on gray iron and steel castings, and the program includes three symposiums, by four authors each, on the gating of castings, on the relation of the engineer to the foundry and on the manufacture of electric steel castings, respectively. Special emphasis is also placed on a new safety code for iron, steel and brass foundries to be presented. Special attention is also called to a report to come from the committee on foundry scrap, this aiming to put quotations on a uniform net ton basis in every important scrap center. The reclamation of waste foundry sand is to considered by several authors. Brass foundry practice will be discussed Wednesday morning; heat treatment, corrosion, etc., Thursday, and papers on physical tests, metallography, etc., are announced for Friday morning.

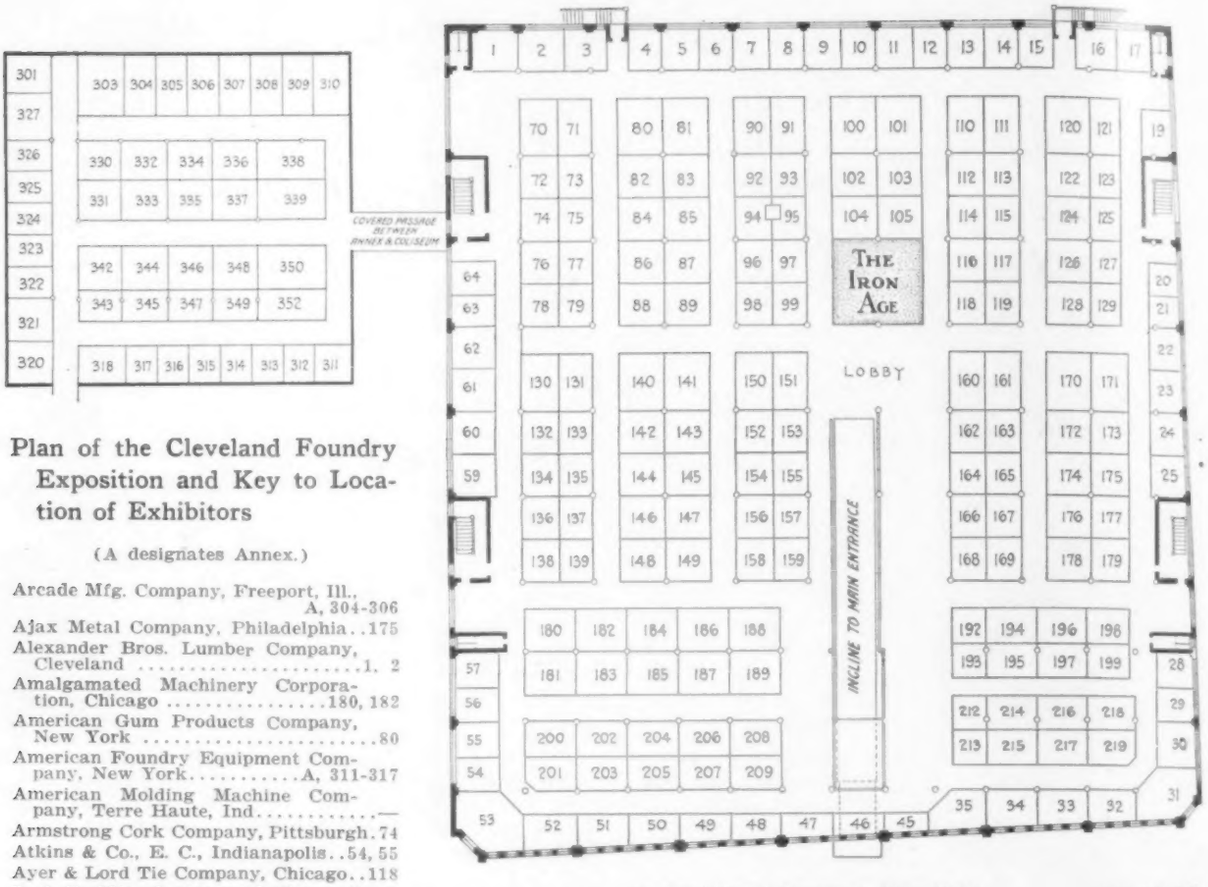
A. O. Backert, Secretary, A. F. A.

Two buildings were required to provide space for the exhibitors. It was first intended to house the exhibition in the Coliseum on East Thirteenth Street near Euclid Avenue, but the 60,000 sq. ft. proved insufficient, and a temporary annex, affording 10,000 sq. ft. additional exhibition area, was built alongside the Coliseum, as indicated in the plan on the following page. There will be over 30 per cent more exhibitors than participated in the exhibition last year at Atlantic City, and there will be numerous operating exhibits.

J. L. Jones, President, A. I. M.

Prior to 1906 individual manufacturers of foundry devices displayed their products in hotel rooms, but in that year a half dozen manufacturers in Cleveland and vicinity formed an organization for the conduct of an exhibition. Thus ten years later in the same city the organized method of showing the latest advances in the art is taken over by the associations on whose account it was instituted. In 1906, 42 companies made displays, though there were not that many booths; while this year there are upward of 130 exhibitors to whom space has been allotted. Meanwhile the associations themselves have gained in membership in the interval from some 300, this including the brass operators, to nearly 1000 to-day in the American Foundrymen's Association and close to 400 in the American Institute of Metals. The entertainment features are noted in the accompanying condensed program of foundry week. At the banquet, Thursday evening, Secretary of War Newton D. Baker and Irving Bacheller, the author, will be the speakers. Henry A. Carpenter, vice-president of the American Foundrymen's Association, will be toastmaster. Plant visitations will be limited to two days.

W. M. Corse, Secretary, A. I. M.



Plan of the Cleveland Foundry Exposition and Key to Location of Exhibitors

(A designates Annex.)

Arcade Mfg. Company, Freeport, Ill., A, 304-306
Ajax Metal Company, Philadelphia..175
Alexander Bros. Lumber Company, Cleveland 1, 2
Amalgamated Machinery Corporation, Chicago 180, 182
American Gum Products Company, New York 80
American Foundry Equipment Company, New York.....A, 311-317
American Molding Machine Company, Terre Haute, Ind.....—
Armstrong Cork Company, Pittsburgh..74
Atkins & Co., E. C., Indianapolis..54, 55
Ayer & Lord Tie Company, Chicago..118
B. & B. Mfg. Company, Indianapolis.....—
Beighlee Electric Company, Cleveland.....50
Berkshire Mfg. Company, Cleveland,.....A, 350,-351
Besly & Co., Charles H., Chicago.....96, 98
Birkenstein & Sons, S., Chicago.....111
Blystone Mfg. Company, Cambridge Springs, Pa.....112
Brass World Publishing Company, New York.....46
Brown Hoisting Machinery Company, Cleveland....A, 346, 348
Brown Specialty Machinery Company, Chicago.....110
Buckeye Products Company, Cincinnati.....195
Carborundum Company, Niagara Falls, N. Y.....168, 169
Cataract Refining & Mfg. Company, Buffalo.....171
Champion Foundry Machinery Company, Chicago....A, 345
Chicago Eye Shield Company, Chicago.....163
Chicago Pneumatic Tool Company, Chicago.....130, 132
Cincinnati Pulley Machinery Company, Cincinnati.....218
Clark, Charles J., Chicago.....49
Cleveland Blow Pipe & Mfg. Company, Cleveland.....51
Cleveland Pneumatic Tool Company, Cleveland.....170
Cleveland Wire Spring Company, Cleveland.....155
Coale Lumber Company, Thomas E., Philadelphia.....16, 17
Curtis Pneumatic Machinery Company, St. Louis.....90
Dalton Adding Machine Company, Norwood, Cincinnati..198
Davis, Bournonville Company, Jersey City, N. J.....33, 34
Demmler, Wm., & Bros., Kewanee, Ill.....A, 347
Davenport Machine & Foundry Company, Davenport, Iowa.136
Dixon Crucible Company, Joseph, Jersey City, N. J.....151
Electric Controller & Mfg. Company, Cleveland.....47
Excelsior Tool & Machine Company, East St. Louis, Ill., 138, 139
Federal Foundry Supply Company, Cleveland.....81, 83, 85
Felt & Tarrant Mfg. Company, Chicago.....129
Foundry Equipment Company, Cleveland.....3
Foundry, The, Cleveland.....20-25
Gardner Machine Company, Beloit, Wis.....59-64
General Electric Company, Schenectady, N. Y.....28-31
Gisholt Machine Company, Madison, Wis.....167
Goldschmidt Thermit Company, New York.....105
Gordon Sand Company, Conneaut, Ohio.....9
Graceton Coke Company, Graceton, Pa.....56, 57
Great Western Mfg. Company, Leavenworth, Kan.....101
Hardy & Co., F. A., Chicago.....124
Harris & Co., Benjamin, Chicago.....184
Hauck Mfg. Company, Brooklyn, N. Y.....A, 326
Hayward Company, New York.....A, 331, 333
Herman Pneumatic Machine Company, Pittsburgh.....149
Herold Bros. Company, Cleveland.....93
Holland Case Oil Company, Chicago.....174
Holz, Herman A., New York.....50
Hill-Brunner Foundry Supply Company, Cincinnati.....159
Hill & Griffith Company, Cincinnati.....113, 115
Hoevel Mfg. Corporation, New York.....176
Imperial Brass Mfg. Company, Chicago.....189
Ingersoll-Rand Company, New York.....141, 143, 145
International Molding Machine Company, Chicago.....8
Interstate Sand Company, Zanesville, Ohio.....10
IRON AGE, THE, New York.....106-109
Iron Trade Review, The, Cleveland.....20-25
Jamison Coal & Coke Company, Pittsburgh.....195
Jennison-Wright Company, Toledo, Ohio.....192
Kawin Company, Charles C., Chicago.....75
King Optical Company, Julius, New York.....104
Lake Erie Smelting & Refining Company, Cleveland.....172
Lakewood Engineering Company, Cleveland.....120
Lane, H. M., Detroit.....—
Lees-Bradner Company, Cleveland.....35
Lehigh Coke Company, South Bethlehem, Pa.....148
Life Saving Devices Company, Chicago.....15
Lincoln Electric Company, Cleveland.....19
Lucas Machine Tool Company, Cleveland.....177
Lupton's Sons Company, David, Philadelphia.....84
McCormick Company, J. S., Pittsburgh.....103
MacLean Publishing Company, Toronto, Ont., Canada....127
Macleod Company, Cincinnati.....A, 326, 330, 332
Mahr Mfg. Company, Minneapolis.....A, 343
Malleable Iron Fittings Company, Branford, Conn.....77
Manitowoc Electric Implement Company, Manitowoc, Wis.48
Metal Industry, New York.....94
Metal Record and Electroplater, Bridgeport, Conn.....49
Michigan Smelting & Refining Company, Detroit.....91
Midland Machine Company, Detroit.....A, 324, 325
Moldar Company, Maspeth, N. Y.....4
Moltrup Steel Products Company, Beaver Falls, Pa.....157
Monarch Engineering & Mfg. Company, Baltimore..131, 133
Mott Sand Blast Mfg. Company, Chicago.....A, 340, 342, 344
Multi-Metal Separating Screen Company, New York.....92
Mumford Company, E. H., Elizabeth, N. J.....A, 335, 337
Mumford Molding Machine Company, Chicago.....153
National Engineering Company, Chicago.....A, 303
New Haven Sand Blast Company, New Haven, Conn., A, 321, 322, 323
Norma Company of America, New York.....165
Norton Company, Worcester, Mass.....86-88
Obermayer Company, S., Chicago.....79
Oliver Machinery Company, Grand Rapids, Mich..A, 338, 339
Osborn Mfg. Company, Cleveland.....70-73
Oxweld Acetylene Company, Chicago.....186, 188
Paxson Company, J. W., Philadelphia.....193
Panghorn Corporation, Hagerstown, Md.....150
Philadelphia Bourse, Philadelphia.....—
Phoenix Mfg. Company, Eau Claire, Wis.....194
Pickands, Brown & Co., Chicago.....126, 128
Pittsburgh Crushed Steel Company, Pittsburgh.....125
Portage Silica Company, Youngstown, Ohio.....137
Pridmore, Henry E., Chicago.....A, 307-310
Prest-O-Lite Company, Indianapolis 181, 183

Pyrotectite Company, Chicago....208
Railway Mechanical Engineer, Chicago....213
Robeson Process Company, New York....117, 119
Rogers, Brown & Co., New York....11-14
Sand Mixing Machine Company, New York....A, 311-317
Searchlight Company, Chicago....53
Sipp Machine Company, Paterson, N. J....32
Sly Mfg. Company, W. W., Cleveland....142, 144, 146
Smith Company, Werner G., Cleveland....160, 161
Smith Facing & Supply Company, Cleveland....7
Smith & Sons, R. P., Chicago....102
Standard Sand Machine Company, Cleveland....147
Sterling Wheelbarrow Company, West Allis, Wis....87, 89
Stevens, Frederic B., Detroit....158
Stodder, W. F., Syracuse, N. Y....125
Strong, Kennard & Nutt Company, Cleveland....116
Sullivan Machinery Company, Chicago....A, 301, 327
Superior Sand Company, Cleveland....162
Thomas Elevator Company, Chicago....196
Titanium Alloy Mfg. Company, Niagara Falls, N. Y....97-99
Union Steam Pump Company, Battle Creek, Mich....76, 78
U. S. Graphite Company, Saginaw, Mich....135
U. S. Molding Machine Company, Cleveland, 152, and A. 334, 336
United States Silica Company, Chicago....114
Wadsworth Core Machine & Equipment Company, Akron, Ohio....154, 156
Wallace, J. D., Chicago....45
Warner & Swasey Company, Cleveland....178, 179
West Haven Mfg. Company, New Haven, Conn....219
Wheeler & Holcomb, Chicago....95
White & Bros., Ltd., Philadelphia....166
Whiting Foundry Equipment Company, Harvey, Ill....140
Wood's Sons, T. B., & Co., Chambersburg, Pa....134
Woodison Company, E. J., Detroit....100

Exhibitors and the Products Displayed

Alexander Bros. Lumber Company, pattern and flask lumber specialists, Cleveland, Ohio.—Represented by H. L. Spitler and M. F. Fitzgerald.

Ajax Metal Company, Philadelphia, Pa.—Ajax process ingot and babbitt metals. Represented by G. H. Clamer, C. F. Hopkins, F. M. Willeson, C. F. McRae and L. E. Purnell.

Amalgamated Machinery Corporation, Chicago, Ill.—Machine for boring and finishing large high-explosive shells. Represented by N. A. Mears.

American Foundry Equipment Company and Sand Mixing Machine Company, Combined, New York.—New design self-propelled automatic sand cutter for cutting and tempering sand for floor molders where required; automatic sand blast tumbling barrels and rotary table sand blast room. Represented by H. L. Wadsworth, Hutton H. Haley, John B. Alexander, John Bradley, V. E. Minich and others.

American Gum Products Company, New York.—Samples of core binder and cores. Represented by G. I. Lindsay, W. E. Baird, J. F. Gaffney and R. H. Mills.

American Molding Machine Company, Terre Haute, Ind.

Arcade Mfg. Company, Freeport, Ill.—Power roll-over jolt, combination jolt squeezer, plain jolter, machine for making piston castings and a core jolter. Represented by E. H. Morgan, Charles Morgan, L. L. Munn, Henry Tscherning, R. E. Turnbull, August Christen and G. D. Wolfley.

Armstrong Cork Company, Pittsburgh, Pa.—Brick for insulation of furnaces and kindred high-temperature equipment, high-pressure covering for steam lines, boilers, etc., and cork covering for service lines and building equipment. An electric furnace will be in operation to illustrate its insulating brick. Represented by E. C. Lloyd and P. W. Lamson.

E. C. Atkins & Company, Inc., Indianapolis, Ind.—Line of saws, including circular metal-cutting, metal-cutting band, hacksaw blades and frames, saw-fitting tools and friction disks. Demonstration of power hacksaw machine and hacksaw blades. Represented by Thomas H. Endicott, T. A. Carroll and A. Mertz.

Ayer & Lord Tie Company, Chicago, Ill.—Section of 3-in. interior creosoted wood block floor. Represented by A. H. Noyes, W. H. Blythe, F. W. Maechler, B. S. McConnell, S. C. Conway and R. C. Inslee

B. & B. Mfg. Company, Indianapolis, Ind.—Stationary

Condensed Program of Foundry Week

Monday, Sept. 11

9:00 a. m.—Registration, mezzanine floor, Hotel Statler.

2:00 p. m.—Opening of the exhibition in the Coliseum and the Annex.

2:30 p. m.—JOINT OPENING SESSION, American Foundrymen's Association and American Institute of Metals, Hotel Statler.

Tuesday, Sept. 12

10:00 a. m.—JOINT SESSION, American Foundrymen's Association and American Institute of Metals.

3:00 p. m.—Ball game, Cleveland vs. Detroit, American League Park.

8:15 p. m.—Theater party.

Wednesday, Sept. 13

10:00 a. m.—PROFESSIONAL SESSION of the American Foundrymen's Association at the Hotel Statler, for the discussion of general topics.

10:00 a. m.—PROFESSIONAL SESSION, American Institute of Metals, Hotel Statler, for the discussion of foundry practice.

12:00 m.—Ladies' luncheon at the Hotel Statler.

1:00 p. m.—Inspection of the Cleveland Furnace Company's plant. Sight-seeing automobiles will make trips at 30-min. intervals from the Hotel Statler to the blast furnace plant.

2:00 p. m.—Ladies' sight-seeing automobile trip.

7:30 p. m.—Trip to Euclid Beach Park in special cars.

Thursday, Sept. 14

10:00 a. m.—STEEL SESSION, American Foundrymen's Association, Hotel Statler.

10:00 a. m.—MALLEABLE SESSION, American Foundrymen's Association, Hotel Statler.

10:00 a. m.—PROFESSIONAL SESSION of the American Institute of Metals, at the Hotel Statler, for the discussion of heat-treatment, corrosion, etc.

7:00 p. m.—Annual banquet, Hotel Statler.

Friday, Sept. 15

10:00 a. m.—GRAY-IRON SESSION, American Foundrymen's Association, Hotel Statler.

10:00 a. m.—STEEL SESSION, American Foundrymen's Association, Hotel Statler.

10:00 a. m.—PROFESSIONAL SESSION of the American Institute of Metals, at the Hotel Statler, for the discussion of physical tests, metallography, etc.

12:00 m.—FINAL BUSINESS SESSION, American Foundrymen's Association, Hotel Statler.

Saturday, Sept. 16

5:00 p. m.—Exhibition closes.

Plant visitation is limited to Thursday and Friday, Sept. 14 and 15

power squeezer with power unit; portable power squeezer with power unit and stationary hand power and squeezer machine of new design. Represented by the Cleveland Power Transmission Company.

Beighlee Electric Company, Inc., Cleveland, Ohio.—Indicating and recording pyrometer equipment of the compensating cold-junction type.

Berkshire Mfg. Company, Cleveland, Ohio.—Automatic molding machine, hand and air squeezer machines, jolt squeezer machines, vibrators, etc. Represented by W. A. Price, C. L. V. Evans, W. D. Fraser, F. Hulec and G. L. Cannon.

Charles H. Besly & Company, Chicago, Ill.—Pattern makers' disk grinding machine and disk grinding machine, both motor-driven; wide-face ring wheel grinding machine and vertical spindle disk grinding machine, both belt-driven. Also abrasive disks and various accessories for its equipment. Represented by Edward P. Welles, Charles A. Knill, Ralph W. Young, Leo E. Jacobs and George Klemp.

S. Birkenstein & Sons, Chicago, Ill.—Special metal products for brass and aluminum foundries and castings from them. Represented by Harry Birkenstein, Lee Kahn, M. Schero, H. Goldstein and Charles Raphael.

Blystone Mfg. Company, Cambridge Springs, Pa.—Low standard motor-driven ore sand mixers with screen attached and equipped with power dump. Represented by W. J. Pees and Luther G. Conroe.

Brown Hoisting Machinery Company, Cleveland, Ohio.—Tramrail equipment with switch, turntable, I-beam trolley and hoists; also overhead hand traveling crane with trolley and hoist. Represented by A. R. Leeds and F. D. Johnson.

Brown Specialty Machinery Company, Chicago, Ill.—Three styles of hammer core machines, electric duplex shaker, pneumatic duplex shaker, revolving barrel sand blast machine and three sizes of rotary table machines. Represented by John Laycock, J. E. Sweet and Elmer A. Rich, Jr.

Buckeye Products Company, Cincinnati, Ohio.

Carborundum Company, Niagara Falls, N. Y.—Carborundum and Aloxite wheels for foundry use, Carborundum fire sand and silicon metal. Represented by George R. Rayner, G. T. Eastabrook, W. U. Parrott, C. W. Bardon, W. Walters, C. D. Sargent, O. C. Dobson, J. P. McCann, T. B. Woodrow and C. E. Hawke.

Cataract Refining & Mfg. Company, Buffalo, N. Y.—Core oils and compounds, partings, cutting lubricants, compounds and oils, with samples of cores, castings, made with Cataract material, etc. Bolt machine will be operated using company's cutting lubricants. Represented by J. Purvis, Jr., J. E. Chism, E. P. Hughes, D. L. Baldsin, A. A. Schaefer, A. C. Breese, R. M. Hitch, W. E. Williams, F. N. Tweedy, E. H. Coburn, B. Deacon, C. W. Seibold, H. C. Newton, T. E. Kenefick and H. C. Hutchins.

Champion Foundry Machinery Company, Chicago, Ill.—Electric sand riddles in operation. Represented by H. O. Magnuson, William Magnuson and A. Magnuson.

Chicago Eye Shield Company, Chicago, Ill.—Safety goggles and lenses for eliminating violet rays. Represented by Robert Malcom aand Dr. Brennecke.

Chicago Pneumatic Tool Company, Chicago, Ill.—Pneumatic chipping hammers, rammers, hoists, compressors, drills, casting cleaners, electric drills and grinders. Represented by A. C. Andresen, T. D. Slingman, T. G. Smallwood, J. G. Osgood and others.

Cincinnati Pulley Machinery Company, Cincinnati, Ohio.—Three motor-driven machines in operation, two single-spindle and one two-spindle with pump and lubricant connection; three machines not in operation, two single-spindle and one single-spindle with power feed and round column. Represented by L. B. Patterson, J. G. Hey, J. F. Mirrielles and C. K. Cairns.

Charles J. Clark, Chicago, Ill.—Operating exhibit, showing use of blast meter and line of instruments for measuring volume and pressure of blast to cupolas, malleable and other industrial furnaces. Represented by Charles J. Clark.

Cleveland Blow Pipe & Mfg. Company, Cleveland, Ohio.—Dust collecting system for emery and grinding wheels, consisting of motor-driven exhaust fans, dust trap and piping; also sheet-metal shower bath installation. Edward Coney will represent the company.

Cleveland Pneumatic Tool Company, Cleveland, Ohio.—Air tools, including riveting and chipping hammers, drills, sand rammers, core breakers, valve grinders, air hose couplings, etc. A riveting hammer will be shown which embraces features not heretofore used in such hammers.

Cleveland Wire Spring Company, Cleveland, Ohio.—Steel barrels, boxes and waste cans. Represented by J. W. Campbell, C. H. Erickson, J. Marshall and C. C. Klingman.

Thomas E. Coale Lumber Company, Philadelphia, Pa.—Michigan soft cork white pine and display of California sugar pine pattern lumber. Represented by Thomas E. Coale, E. C. Anderson and A. Warren Anderson.

Curtis Pneumatic Machinery Company, New York.—Controlled splash oiling system air compressor with adjustable sight-feed cylinder lubricating feature, new type reciprocating vertical air hoist for washing and pickling operations, single I-beam crane for foundry and machine shop, closed hoppers sand blast, small compressors, single I-beam trolley and illustrations of representative installations and of devices not exhibited. Represented by L. C. Blake and the staff of the Charles E. Stamp Company.

Dalton Adding Machine Company, Cincinnati, Ohio.—Adding, listing and calculating machines, both hand and motor-driven. Represented by R. Lancaster Smith.

Davenport Machine & Foundry Company, foundry molding machines, Davenport, Iowa.—Represented by John T. Anderson and Carl Falk.

Davis-Bournonville Company, Jersey City, N. J.—Oxy-acetylene and oxy-hydrogen welding and cutting apparatus, with working exhibit, showing application in foundry work, general repairs and manufacturing. Represented by Hugh H. Dyar, William H. Joyce, Alex Blazer and Messrs. Lindholm and Gill.

William Demmler Bros., Kewanee, Ill.

Joseph Dixon Crucible Company, Jersey City, N. J.—Graphite products including crucibles, stoppers, nozzles, sleeves, phosphorizers, stirrers, foundry facings, etc. Represented by Dudley A. Johnson, H. C. Sorenson, F. R. Brandon and J. A. Biel.

Electric Controller & Mfg. Company, Cleveland, Ohio.—Lantern slides of its products. Represented by F. R. Fishback and M. Converse.

Excelsior Tool & Machine Company, East St. Louis, Ill.—Polishing machines, one in operation on stove top, the other in operation polishing pipe; also polishing and buffing lathe in operation. Represented by T. F. Philippi and assistant.

Federal Foundry Supply Company, Cleveland, Ohio.—Jolt and squeeze machines, plain squeezers and line of jolt machines and foundry supplies. Represented by W. J. Adams, R. Ditty, E. Kaye, I. D. Adams, C. Collins, John Bayer and L. H. Heyl.

Felt & Tarrant Mfg. Company, Chicago, Ill.—Demonstration of controlled-key duplex comptometer adding and calculating machine as applied to book work, billing, estimating, pro-rating, cost calculations, etc. Represented by J. C. Nevins, W. F. Sims, J. G. Luniak, W. G. Resch and Miss Irma Urban.

Foundry Equipment Company, Cleveland, Ohio.—Stationary core ovens of roller drawer type, brass and aluminum furnaces, sprue cutters, squeezers, crucible lever lifters, core makers' benches and oil burners. Represented by Julius Tuteur, F. A. Coleman and C. A. Barnett.

Gardner Machine Company, Beloit, Wis.—Grinders in sizes ranging from 12-in. to 53-in., both belt and motor-driven; pattern-makers' disk grinders and ball bearing polishing lathes, several of which will be in operation; accessories and parts. Represented by L. W. Thompson, F. E. Gardner, W. B. Leishman, J. M. Gardner, E. L. Beisel, V. E. Breyley, W. L. Townsend and D. C. Graves.

General Electric Company, Schenectady, N. Y.—Line of control devices, switchboards, panels, motor and a 300-ampere portable arc-welding outfit. Represented by J. W. Ham, J. A. Seede, J. Eaton, R. E. Wooley, O. W. Buddington, L. W. Shugg, W. J. Hanley, G. E. Guy and J. A. Boers.

Gibb Instrument Company, Pittsburg, Pa.—I-Rite pyrometer. Represented by W. H. Gibb and J. R. Brueckner.

Gisholt Machine Company, Madison, Wis.—Display of the periodograph for obtaining time records in operation. Represented by Ellis F. Muther, W. J. Hannum, R. M. Carter, Howard E. Preston and Charles B. Carr.

Goldschmidt-Thermit Company, New York.—Line of carbon-free metals; 50 per cent ferrosilicon; samples of Thermit welds on heavy sections of wrought iron and steel, with illustrations covering the process adapted to repairs on steel mill equipment, and a line of Thermit and Titanium Thermit cans for use in foundry ladles. Demonstrations of pipe welding. Represented by D. B. Browne, H. G. Spilsbury, J. G. McCarty, H. D. Kelley and E. B. Bloom.

Gordon Sand Company, Conneaut, Ohio.—Reception booth. Represented by F. E. Gordon. U. E. Kanavel, W. R. Thompson and H. A. Keener.

WALTER WOOD
Vice-Pres. Am. Foundrymen's Asso.

H. E. FIELD
Vice-Pres. Am. Foundrymen's Asso.

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B. D. FULLER
Vice-Pres. Am. Foundrymen's Asso.

Graceton Coke Company, Graceton, Pa.—Specimens of foundry coke.

Great Western Mfg. Company, Leavenworth, Kan.—Gyratory foundry riddle, gyratory foundry riddle with no-dump sieve for continuous riddling, and similar riddle with large sieve for contractors' use. Represented by F. A. Pickett and George W. Combs.

F. A. Hardy & Company, Chicago, Ill.—Safety devices, including eyeglasses, goggles, respirators and helmets. Represented by C. S. Wells and W. B. Gosman.

Benjamin Harris & Company, Chicago, Ill.—Various grades of ingot brass and castings made therefrom. Represented by L. Goldman, N. Harris and O. Harris.

Hauck Mfg. Company, Brooklyn, N. Y.—Compressed air and hand pump cupola lighters, skindrying outfits, kerosene torches, core oven burners, ladle heaters, rivet forges, blacksmith and brazing forge and aluminum melting furnaces. Represented by A. Busch Hauck and A. P. Link.

Hayward Company, New York.—An operating exhibit will be made of electric motor clam shell buckets. There will also be shown clam shell buckets of other types, orange peel buckets and drag scraper buckets. Representatives: H. S. Atkinson, production engineer; C. F. Hutchings and H. M. Davison, sales engineers.

Herman Pneumatic Machine Company, Zelienople, Pa.—Small type jarring machine. Represented by A. M. Frauenheim, H. T. Frauenheim, Alfred Herman, Robert Ringle, Andrew Rodgers, R. P. Morgan, Robert Walker and Thomas Kaveny.

Herold Bros. Company, Cleveland, Ohio.

Hill-Brunner Foundry Supply Company, Cincinnati, Ohio.—Reception booth. Represented by John Hill, Bruce Hill Fred J. Brunner.

Hill & Griffiths Company, Cincinnati, Ohio.

Hoevel Mfg. Corporation, New York.—Catalogs. Represented by H. F. Hoevel, F. W. Weiss and L. B. Passmore.

Holland Core Oil Company, Chicago, Ill.

Herman A. Holz, New York.—Portable apparatus for the determination of the Brinell hardness of metals and metal products, independent of their dimensions, shape, etc. Represented by William O. Little.

Imperial Brass Mfg. Company, Chicago, Ill.—Oxy-acetylene and oxy-hydrogen welding, cutting and decarbonizing equipment. Represented by F. McNellis, Charles E. Young, J. Meskan and J. F. Schroeter.

Ingersoll-Rand Company, New York.—Bench and floor types of pneumatic sand rammers, ½ to 5-ton air motor hoists, complete line of chipping, calking and scaling hammers, core breaker, pneumatic grinder, reversible and non-reversible drills, close-quarter drills, riveting hammers with and without safety retainer, jam-riveters, holder-ons for backing up rivets, chipping hammers, pneumatic core-breaking hammer, and 12 and 7½ x 12 duplex air compressor, short belt and motor-driven, in operation running exhibits of pneumatic machinery. Represented by W. A. Armstrong, George A. Gallinger, Walter A. Johnson, J. E. Kemmerling and George C. Williams.

International Molding Machine, Chicago, Ill.—Represented by Edward A. Pridmore, W. W. Miller, J. W. Dopp and F. W. Hamel.

Interstate Sand Company, Zanesville, Ohio.

Jamison Coal & Coke Company, Pittsburgh, Pa.

Jennison-Wright Company, Toledo, Ohio.—Samples of Kreolite wood blocks and structural timbers, showing types of floor blocks designed for machine shops, foundries, pickling rooms, annealing rooms, forge shops, driveways, loading platforms, etc. Represented by A. W. Cobley, H. G. Jennison, W. E. Wright, F. W. Cherrington, E. M. Humphrey and H. P. Consaul.

Charles C. Kawin, Chicago, Ill.—Represented by Charles C. Kawin, John J. Nellis, J. H. Hopp and R. J. Courtney.

Julius King Optical Company, Chicago, Ill.—Line of safety eye protectors, welding helmets and sand blast helmets. Represented by W. G. King, J. J. Duffy, A. G. Larson and Edmond Harold.

Lake Erie Smelting & Refining Company, Cleveland, Ohio.

Lakewood Engineering Company, Cleveland, Ohio.

H. M. Lane Company, Detroit, Michigan.—Represented by H. M. Lane and two others of the company.

Lehigh Coke Company, South Bethlehem, Pa.—Samples of foundry cokes and by-products and photographs of the company's plant. Represented by D. A. Barkley and Robert McDonald.

Lees Bradner Company, Cleveland, Ohio.

Life Saving Devices Company, Chicago, Ill.

Lincoln-Electric Company, Cleveland, Ohio.—A 300-amp. arc welder. Represented by Robert E. Kinkead.

Lucas Machine Tool Company, Cleveland, Ohio.—Special 50-ton power forcing press, adapted for straightening heavy malleable-iron castings. Represented by J. A. Leighton, Jr., and F. P. Sprague.

David Lupton's Sons Company, Philadelphia, Pa.—Steel sash of counter-balanced type and continuous sash with operating device; also photographs and drawings of applications to foundry lighting and ventilation with photographs of installations. Represented by Clarke P. Pond, C. F. P. Buckwalter and William Pfielder.

J. S. McCormick Company, Pittsburgh, Pa.—Pan grinder and mixer, gyratory motor-driven riddle, core oven plates and foundry supplies and facings. Represented by J. S. McCormick, T. E. Malone, S. R. Costley and A. T. Richardson.

MacLeod Company, Cincinnati, Ohio.—Sand blast barrels, sand blast machine, dust arrester, portable oil burners and oxy-acetylene welding and cutting apparatus. Represented by Walter MacLeod, O. P. Gwinner and Gus Schmidt.

Mahr Mfg. Company, Minneapolis, Minn.—Portable foundry torches and portable oil-burning rivet forge. Represented by J. A. Mahr, F. N. Brooker and F. A. Davis.

Malleable Iron Fittings Company, Branford, Conn.—Line of vibrators from ⅜ in. to 2 in., new line of valves, fittings and clamps for attaching vibrators to molding machines. Represented by G. B. Pickop and J. C. Page.

Manitowoc Electric Implement Company, Manitowoc, Wis.—Electric vibrators for alternating current and direct current. Represented by Frank Brixius and Rude Stockinger.

Michigan Smelting & Refining Company, Detroit, Mich.—Specimens of ingot brass and finished brass products, non-ferrous ingot metals and samples of lead pipe, solders, babbitt metals, etc. Represented by Joseph Silliman, C. O. Patch, Henry Levitt, A. J. Hall, W. J. Schweitzer, A. J. Oates, H. D. LeBel, J. D. LeBel, H. E. Berliner, R. H. Evans and G. W. Larissy.

Midland Machine Company, Detroit, Mich.—Jolt roll-over pattern drawing machine with special car for taking molds out on floor, and hand roll-over machine. Represented by G. L. Grimes, E. L. Grimes, L. V. Grimes and C. J. Skeffington.

Moldar Company, Maspeth, N. Y.—Roller-ramming and molding machines and sand-handling appliance. Represented by George M. Etzel.

Moltrup Steel Products Company, Beaver Falls, Pa.—Line of steel pattern plates, including plates with pattern mounted, finished machine keys, cold-drawn steel bars and finished machine racks. Represented by F. H. Guppy and N. S. Leyda.

Monarch Engineering & Mfg. Company, Baltimore, Md.—Battery of core ovens of various types with oil, gas, coal or coke as fuel; stationary oil furnace, tilting oil furnace, tilting coke furnace; also single and double chamber furnaces for use without crucibles. Represented by H. D. Harvey, James J. Allen, W. Raber and F. Maujean.

Mott Sand Blast Mfg. Company, New York—New type round table machine using direct pressure in blasting operation and arranged with vibrating separator for recovering abrasive material; direct-pressure sand blast barrels equipped with same recovery apparatus; cabinet for cleaning small tools; exhausters; dust collectors; standard direct-pressure hose machines and full line of accessories. Represented by E. J. Rosenthal, David Mayer, Foster J. Hull, Charles T. Bird, E. C. Gilmour, George D. Flether and Louis Schroeder.

Multi-Metal Separating Screen Company, New York—Respirators, sand blast helmets, dust hoods, babbitting masks and acid masks. Represented by Frederick Stern.

E. H. Mumford Company, Elizabeth, N. J.—Combination jolt and squeeze ramming split-pattern machines, low and high trunnion jolt squeezers, plain squeezers, plain split-pattern machines and jolt rammers. Represented by T. J. Mumford and H. W. Sinclair.

Mumford Molding Machine Company, Chicago, Ill.—High trunnion squeezer (10-in.). Represented by James T. Lee, Donald Alexander, Otto F. Weiss, D. M. Whyte, L. R. Palmer and Arthur F. Jensen.

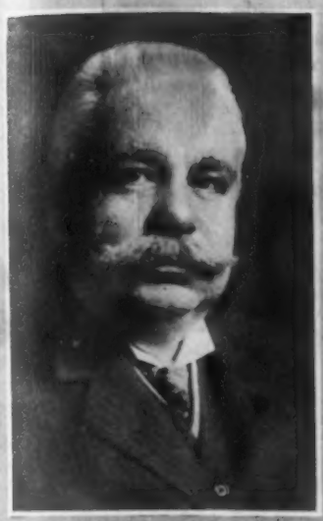
National Engineering Company, Chicago, Ill.—Intensive pan mill 6-ft. diameter foundry mixer in operation. Represented by P. L. Simpson.

New Haven Sand-Blast Company, New Haven, Conn.—Sand blast rolling barrel, several hose type machines and other accessories. Represented by C. E. Billings, C. S. Johnson and Charles A. Dreisbach.

Norma Company of America, New York—Line of precision ball, roller, thrust and combination bearings, arranged to illustrate the mounting of bearings and assembly of parts. Represented by E. A. Perkins and O. P. Wilson.

Norton Company, Worcester, Mass.—Grinding wheels for foundries of bench and floor types, showing new style protection and dust hoods; one machine in operation.

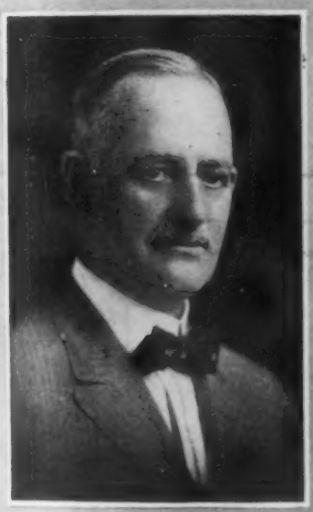
A. F. A. Committee on Exhibits



MAJ. JOS. T. SPEER

ALFRED E. HOWELL

C. E. HOYT



J. P. PERO

H. S. COVEY

S. T. JOHNSTON

Mr. Hoyt, Lewis Institute, Chicago, is exhibition manager of the American Foundrymen's Association, in charge of the Cleveland exposition.

Maj. Speer, Pittsburgh Valve Foundry & Construction Company, Pittsburgh, and former president of the American Foundrymen's Association.

Mr. Howell, Phillips & Buttorff Mfg. Company, Nashville, Tenn., and former president of the American Foundrymen's Association.

Mr. Pero, Missouri Malleable Iron Company, East St. Louis, Ill., and senior vice-president of the American Foundrymen's Association.

Mr. Covey, Cleveland Pneumatic Tool Company, Cleveland.

Mr. Johnston, S. Obermayer Company, Chicago.

Mr. Minich, Sand Mixing Machine Company, New York.

V. E. MINICH

Represented by Carl F. Dietz, A. R. Sandine and R. O. Anderson.

S. Obermayer Company, Chicago, Ill.—New type molding machine. Represented by S. T. Johnston, E. D. Fronman, J. E. Evans, O. C. Olson, F. H. Dodge, William Fenton, O. J. Peterson, C. M. Barker and William Fitzpatrick.

Oliver Machinery Company, Grand Rapids, Mich.—Universal wood milling machine, new ball-bearing jointer with safety features; universal saw bench with guards; vertical spindle and disk sander with ball bearings and single-pulley motor drive; 16-in. motor-driven heavy-duty engine lathe; 14-in. heavy-duty turret lathe and 1½-in. screw machine. Represented by A. S. Karkjian, R. F. Baldwin, M. D. Baldwin, Arthur Blake, J. R. Duthie, T. J. Piers and Herbert Walsh.

Osborn Mfg. Company, Cleveland, Ohio—Roll-over jolts, stripping-plate jolts, split-pattern machines, air squeezers, stripping-plate machines, plain jolts and standard type molding machines. Represented by H. R. Atwater, E. T. Doddridge, M. W. Zeman, J. C. Alberts, E. W. Jacobi, A. J. Goss and others.

Oxweld Acetylene Company, Chicago, Ill.—Demonstration of oxy-acetylene welding and cutting equipment. Represented by E. E. Radcliffe.

Pangborn Corporation, Hagerstown, Md.

J. W. Paxon Company, Philadelphia, Pa.—Paxon-Colliau cupola showing the Zippler tuyereage system, also samples of molding and core sands. Represented by H. M. Bougher, F. J. Zippler and I. F. Kremer.

Phoenix Mfg. Company, Eau Claire, Wis.

Philadelphia Bourse, Philadelphia, Pa.—Represented by L. R. Duffield, who will be prepared to give information concerning the machinery exhibition and salesroom of the Philadelphia Bourse.

Pickands, Brown & Co., Chicago, Ill.—Solvay coke in foundry and crushed sizes. Bow and forward portions of Commodore Perry's flagship Lawrence, built almost entirely of coke. Represented by George A. T. Long, B. T. Bacon, E. A. Bateman, A. B. Hawes, J. A. Galligan, T. W. Glasscot and F. T. Lowering.

Pittsburgh Crushed Steel Company, Pittsburgh, Pa.—Samples of angular grit for sand blast machines and of concrete hardener and facing. Represented by G. H. Kann.

Portage Silica Company, Youngstown, Ohio.—Photographs of the company's plant and quarry, specimens of natural rock, samples of steel molding and core sands and sand blast sands. Represented by E. E. Klooz, C. M. Bixler and L. R. Farrell.

Prest-O-Lite Company, Indianapolis, Ind.—Demonstration of uses of oxy-acetylene welding and cutting apparatus in foundry work. Specimens of risers cut from steel castings. S. M. Paxton, Cleveland branch manager, in charge. H. E. Komitc, director of sales, and H. S. Smith, engineer, in attendance.

Henry E. Pridmore, Inc., Chicago, Ill.—Line of molding machines, power squeezers, power rock-over drop and combination jarring machines with new features. Represented by Mrs. Henry E. Pridmore, Harry A. Pridmore, Charles H. Ellis, D. F. Eagan and A. V. Magnuson.

Pyrotectite Company, Chicago, Ill.

Robeson Process Company, New York—Specimens of cores, photographs and samples of glutrin. Represented by George N. Moore, T. J. Ryan and R. S. Hughes.

Rogers, Brown & Company, Cincinnati, Ohio—Complete exhibit of pig-iron samples, showing influence of various chemical elements in pig iron; also collection of unusual castings. Represented by Standish Meacham, L. C. Calkins, F. J. Waldo, A. F. Stengel, W. T. Shepard, J. C. Mears, J. R. Morehead, T. A. Wilson, S. W. Hubbard, Harwood Wilson, A. J. Wentworth, W. H. Knight, F. W. Miller, F. W. Bauer, R. W. Clark, Cecil E. Bertie and H. W. Fernald.

Searchlight Company, Chicago, Ill.—Demonstrations of oxy-acetylene welding and cutting equipment, and compressed acetylene gas. Represented by R. A. Sossong, H. L. Jillson and P. A. North.

Sipp Machine Company, Paterson, N. J.—Motor-driven single-spindle sensitive drill press; one four-spindle drill press, and universal table drilling machine. Represented by C. A. Widmer.

W. W. Sly Mfg. Company, Cleveland, Ohio—Cleaning mill, resin mill, sand blast mills with dust arrester, core oven, rotary table and photographs. Represented by W. C. Sly, George J. Fanner, R. J. Emerich and P. W. Graue.

Smith Facing & Supply Company, Cleveland, Ohio—Display of the company's products. Represented by J. S. Smith, George W. Fleig and Ray Fleig.

Werner G. Smith Company, Cleveland, Ohio—Core oils, cores and castings. Represented by John C. DeVenne, Milton S. Finley, Louis F. Ferster and Werner G. Smith.

R. P. Smith & Sons Company, Chicago, Ill.—Safety congress shoes for molders and foundrymen. Represented by B. B. Smith, Jr.

Standard Sand & Machine Company, Cleveland, Ohio.

Sterling Wheelbarrow Company, West Allis, Wis.—Rolled steel flasks and wheelbarrows showing new features. Represented by I. R. Smith, H. H. Baker, J. J. Coyne, G. H. Lambkin, E. W. Dowd, C. L. Kirk, J. W. Dopp and J. M. Dickson.

Frederic B. Stevens, Detroit, Mich.—Foundry facings, core compounds, buffing compositions and new stamped steel ladle bowls. Represented by Frederic B. Stevens, W. J. Cluff, J. M. Mayers, Henry Krigner, James F. Hughes, J. M. Johnston, D. D. Baxter and Thomas E. La Mondy.

W. F. Stodder, Syracuse, N. Y.—Suction sand blast nozzle. Represented by W. F. Stodder.

Strong-Kennard & Nutt Company, Cleveland, Ohio—Demonstration for showing strength of goggle lenses and method of determining color values in welding lenses. Protection goggles for grinding, chipping, polishing, welding; also respirators and masks for electric welding. Represented by Buell W. Nutt and Richard Cook.

Sullivan Machinery Company, Chicago, Ill.—Belt-driven angle compound compressor which will supply air to various pneumatic tools shown by exhibitors. Represented by W. R. Jarvis and M. S. Sloman.

Superior Sand Company, Cleveland, Ohio—Samples of molding sand. Represented by W. H. Smith, H. C. Koontz and W. J. Sallee.

Thomas Elevator Company, Chicago, Ill.—Several styles and sizes of wrenchless chucks in operation. Represented by D. T. Siegel and John L. Parkes.

Titanium Alloy Mfg. Company, Niagara Falls, N. Y.—Line of bronze and brass castings, titanium aluminum bronze castings, die castings and samples of ferro-carbon-titanium. Represented by H. H. Cook, A. C. Hawley, W. J. Evans, W. M. Corse, H. R. Corse and Charles Vickers.

Union Steam Pump Company, Battle Creek, Mich.—Inclosed steam-driven high-speed splash-lubricated air compressor, short belt-driven air compressor, vertical duplex short belt-driven and other air compressors.

United States Graphite Company, Saginaw, Mich.—Reception booth. Represented by H. F. Gump, F. B. Godard, W. W. Lampkin, R. A. Corrigan and F. J. Hannon.

United States Molding Machine Company, Cleveland, Ohio—Plain jolt machines, plain air squeezers, combination jolt and squeeze, combination jolt squeeze pattern-draw, combination jolt pattern-draw, combination jolt roll-over pattern-draw, combination squeeze roll-over pattern-draw. Represented by J. N. Battenfeld, C. F. Battenfeld and Joseph Jirka.

United States Silica Company, Chicago, Ill.—Flint shot sand blast sand samples. Represented by A. Volney Foster and Harry S. Goebig.

Wadsworth Core Machine & Equipment Company, Akron, Ohio—Stock core-making machines, sand mixing and compounding mill motor-driven; all-steel reinforced core trays, snap flask bottom boards and a working demonstration of jar ram box-lifting roll-over core-making machine. Represented by George H. Wadsworth, M. C. Sammons and Even George.

J. A. Wallace, Chicago, Ill.—Bench planer with flap and shutter safety guard, motor-driven. Represented by J. D. Wallace.

Warner & Swasey Company, Cleveland, Ohio—Universal hollow hexagon turret lathe, motor-driven, operating on bar work, and universal turret screw machines, motor-driven, operating on chucking work. Represented by A. C. Cook, Ralph Glaser and W. E. Marshall.

West Haven Mfg. Company, New Haven, Conn.—High-speed power hack saw machine, hack saw blades and frames. Represented by A. A. Twichell and W. A. Gilbert.

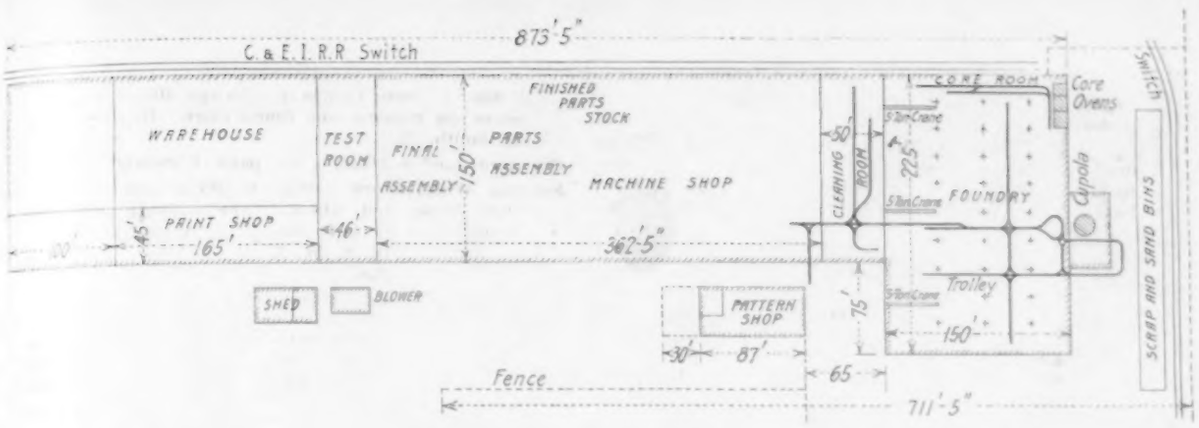
Wheeler & Holcomb, Chicago, Ill.—Fireproof gloves, mittens, leggins, aprons, pants and coats of asbestos cloth, fireproofed duck and leather.

White & Bro., Inc., Philadelphia, Pa.—Casting copper ingots, composition brass ingots and other castings from its ingots. Represented by Raymond Hunter, George C. Procter, Harold C. Reinhardt and Frank Krug.

Whiting Foundry Equipment Company, Harvey, Ill.—Photographs covering its entire line, such as latest type foundry cranes. Represented by C. A. Hardy, R. H. Bourne and G. E. Jones.

T. B. Wood's Sons Company, Chambersburg, Pa.—Taper snap molding equipment, including tapered snap flasks and automatic adjustable snap jackets; and also specimens of castings. Represented by Charles O. Wood, George M. Naylor and Victor Lesher.

T. J. Woodison Company, Detroit, Mich.—Electric vibrator of new design.



Production Methods in Gas Engine Plant

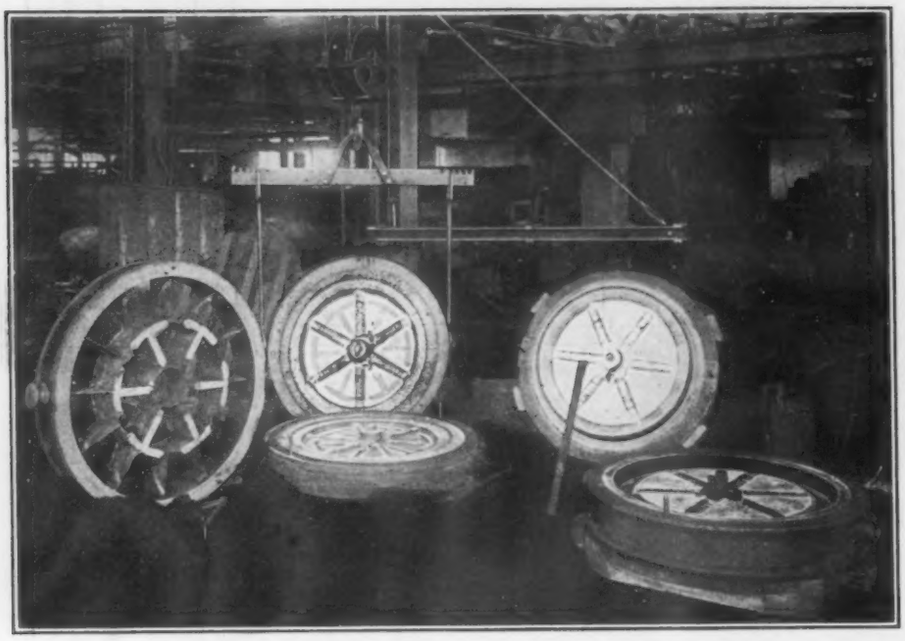
Hercules Gas Engine Company Accelerates Operations with Machine Molding, High Metal Cutting Rate and Piece Work

BY O. J. ABELL

IT is a human quality entering into works organization which is the determining element in making the operation of one plant entirely different from that of another, particularly as between competitors manufacturing the same product. This difference, in its essentials, is not a distinction that has to do with resources, equipment or location, though all of these are factors, but it is that which accounts for successful and profitable business in one instance as against failure in another, particularly in the production of staple materials selling at a small profit margin. There can be observed a contrast in manufacturing methods, apart from questions of good or bad workmanship; a distinction between ability to produce one piece and ability to produce that one piece in quantity at low cost continuously. It is a matter of getting production out of men and machines, and examples of manufacturing operations where "the production sense" is in evidence are still sufficiently limited to make each one an interesting study.

The manufacture of buggies, for example, in the recent years of the ascendency of the power vehicle, has conspicuously made for a survival of the fittest in that industry. The business of the Hercules Buggy Company, Evansville, Ind., is one of the manifestations of that process, and very clearly its fitness to survive has come from an accommodation of its production methods to the changing conditions of its market, without deterioration of product. The wheel shop of this company is an amazing example of consecutive machine operations associated in a sequence that converts raw materials into finished product at maximum speed and minimum cost. In a small shop, perhaps 75 x 150 ft., there are built from the rough lumber

A Floor of Cylinder Head and Cylinder Molds Showing the Manner of Pouring with Cores Made To Eliminate the Cope and the Machine Mounting for the Cylinder Head in the Background



The Mold for Casting the Large Flywheels and the Special Arbor for the Cope, Also the Patterns and the Molds with One of the Former on the Jolt Ramming Machine Employed

1600 wheels per day. Entrance by this company into the manufacture of gas engines, which was undertaken about three years ago, might therefore be expected to introduce similar principles of operation into that activity.

When the business of a small manufacturer of gas engines for farm use was acquired, the Hercules Gas Engine Company was formed to take it over and a foundry and machine shop were erected adjoining the buggy works. It is with the operations of this foundry and machine shop that this article is particularly concerned. The work in the foundry was inaugurated with all of the trials and inefficiency normal to a strange business. In the first year, with a floor area of 150 x 225 ft., and a 90-in. cupola, an average of only 18 tons of castings per day was produced. Now, with approximately the same payroll, but on a piece-rate basis, and with the installation of overhead cranes and trolleys and with machine equipment for the molding of every job of more than 25 pieces, production has been increased to a daily average of 65 tons and a maximum of 75 tons, with total losses not exceeding 3 per cent. The machine shop, in turn, with jigs and fixtures for every possible job, and high speed cutting tools, can finish in a day and night shift 160 gas engines of sizes ranging from 1½ to 12 hp.

The castings production effected in the foundry, a tonnage above the average for non-continuous operation, is obtained despite the building arrangement rather than because of it. To say that delivery of hot metal to the pouring floors is not as easy at it might be because of the restrictions occasioned by building columns, or that the low roof construction is unfavorable to the best light and ventilation, or that the restricted yard space and facilities for charging the cupola interfere with an efficient handling of raw materials, is not a criticism, but rather an emphasizing of the good showing the foundry makes. In the line drawing

The Machines and the Molds for the 1-Hp. Engine Cylinder and Frame with a Floor of These Molds in the Background

the layout of the foundry, cleaning room, machine shop and other departments of the works is shown. The three 5-ton Whiting and Pawling & Harnischfeger electric overhead traveling cranes that serve the bay in which the heavy molds are put up and the overhead trolley system that serves the foundry generally are indicated. In the central bays, 1-ton underslung hand-operated Curtis cranes, with pneumatic hoists, span the full width of the pouring floors. In this connection it is especially interesting to note that the production of certain of the molds which are handled from the machine to the floor for pouring by these Curtis cranes, were remarkably increased by lowering the crane bridges from their position above the runway, as installed, to the underslung position, the cranes responding in their travel along the runway much more readily.

The Molds for the Cylinders for the Larger Engines Are Made in Groups of Four and the Castings Are Poured Without a Cope, a Stripping Plate Being Used

The pronounced increase in production which has been brought about in this foundry has been due to the effective application of molding machines and the piece-rate wage plan. At the time of the installation of mechanical molding equipment, a new force of men was also started, men almost entirely of the inexperienced common labor class, who were gradually trained for their jobs. The molding machine equipment, with the exception of a group of Adams and Arcade squeezer machines, consists of various types built by Henry E. Pridmore, Chicago, including plain electric jolt, electric jolt with pneumatic rock-over or roll-over and plain stripping plate machines.

In the case of the larger engine flywheels, when the job was changed from hand molding to ramming on the jolt machine, two men were able to put up in a day as much as seven men previously had been able to do. These wheels have a diameter of 44 in. and the casting weighs 550 lb. It is made in cope and drag on a 12-in. electric jolt ramming machine. Both the molds and patterns are illustrated. Special attention is called to the large

The Coremaking Section of the Foundry and the Carrier Trays on Which the Green Cores Are Delivered to the Ovens

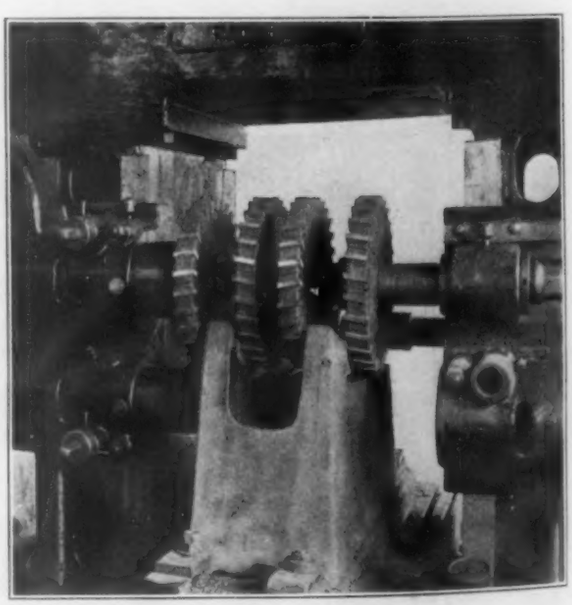
Using a Long-Lipped Ladle To Pour the Large Flywheels in the Center Without a Long Runner

arbor shown at the left, the use of which in ramming the cope mold has obviated the use of gaggers in the cope. To cut down the loss of metal resulting from long runners in pouring these castings, ladles were built with extra long lips, so that these wheels are now poured with the runner box directly over the wheel center. With the use of the arbor mentioned above, the rate at which the jolting machine can produce is more nearly approached, and the molder and helper put up 50 molds a day.

These large flywheels are cast in the bay spanned by the 5-ton cranes, where the other heavier castings are also made. The bases for the larger engines, the six sizes of which range from ½ to 12 hp., are likewise rammed on jolt machines, molds as deep as 36 in. being successfully made on them. The large cylinders are molded in this bay also, the practice on this job being one of the specially interesting operations. Four cylinders are cast in one bolted iron flask. A stripping plate is used in conjunction with the portable plate on which the patterns are mounted, as indicated in the photograph. The patterns for the cylinder bore are mounted on the top plate and thus drawn up through the stripping plate which carries the core prints. When the patterns have been sufficiently withdrawn, the stripping plate is caught by pins on the guides, which align it with the pattern plate at each side, and is lifted out with the pattern plate. The illustration shows the mold, turned over after ramming, with patterns withdrawn and one core set in to indicate the shape in which the core is made to eliminate the use of a cope mold. The cores are held down when the mold is poured by the arbor shown in the foreground. Skim gates are used in pouring all the cylinders, piston and cylinder-head molds, and in the case of the cylinder molds two skim gates are used.

The molds for the smaller cylinders are made on a combination electric jolt and pneumatic roll-over machine, which is mounted on wheels and is operated along a track that parallels the pouring floor, the machine being moved along as the sand is worked up. The mold is made up in a manner similar to the larger one just described. The cylinder-head molds are made on the same machine, which is illustrated together with a view of a floor of cylinder-head and cylinder molds. As may be seen, the cylinder heads are also poured without copes. The trucks on which the molding machine is mounted are provided with a hinge arrangement that permits the machine to be dropped down solidly on the rails during the jolting operation, eliminating the vibration which might ensue were the weight carried on the trucks. With this equipment, a molder and helper are putting up 200 cylinder heads per day.

Another job typical of the practice in this foundry is the cylinder and base for the 1-hp. engine. On two Pridmore drop plate stripping machines, one for the cope and the other for the drag half of the mold, two men at each machine turn out 75 complete molds per day, including the setting of seven cores. The casting which comprises the water reservoir, cylinder and base, all in one piece, for the 1-hp. engine, one half of the mold, the principal cores and the pouring floor are shown in the illustration. The molds are set over onto the floor from the machines with the Curtis travelers, one of which is shown in the background. The under-slinging of this crane on the runway increased the production of these molds by 20 per cent. In the case of the water reservoirs for the 3-hp. engine, the molds for which are made on the adjoining floor on an electric jolt and rock-over machine, the same expedient effected a like increase. Of these latter molds three men put up 130 per day. Molds for various small parts, including cams, bearing caps, etc., are made with match-plate patterns on Adams squeezer machines. Gears and mufflers are molded on Arcade machines, the work being put up in snap flasks. Where tap holes are required in a casting for set screws or cap bolts, as in the case of pulleys and mufflers, nuts of the diameter and thread required are set in the mold with a core to hold them in place, and cast into the piece, saving the otherwise necessary drilling and tapping operation in the machine shop. For the molding of the small pulleys, where the diameter is very small with relation to the hub and the face pretty wide, making it difficult to hold the cores in an ordinary mold, a permanent sectional steel mold has been developed in which six pulleys are cast at a time. This mold consists of six split steel blocks mounted rigidly in a single row on a frame, with a lever and hinge device by which the split blocks may be swung open simultaneously along the central longitudinal axis, and in turn closed and automatically locked. The blocks have plain cylindrical vertical holes through the center, of a diameter corresponding to that of the pulley.



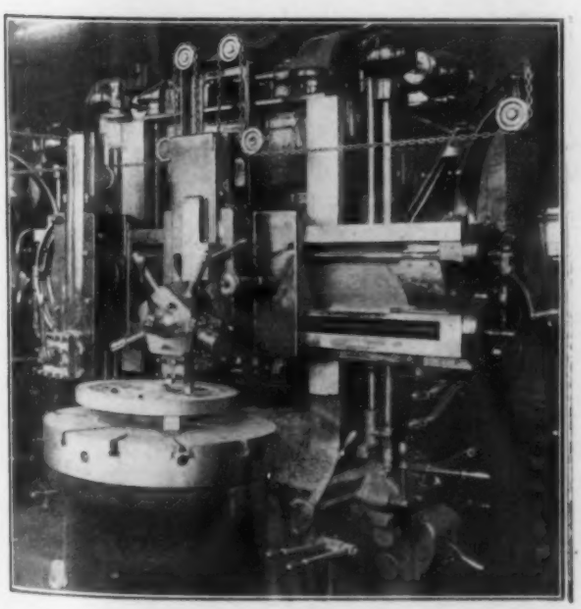
The First Machine Shop Operation on the Larger Engine Beds in Which Nine Cuts Are Taken by a Milling Machine with the Same Setting

Two smaller cores, reversed at top and bottom, with a small set-screw hole core, set in these blocks, complete the mold, which is then poured through the center of the core. The job is taken care of by one of the foundry laborers as an extra task, and at a cost of a fraction of a cent apiece the desired production of these pulleys is obtained in a very short period.

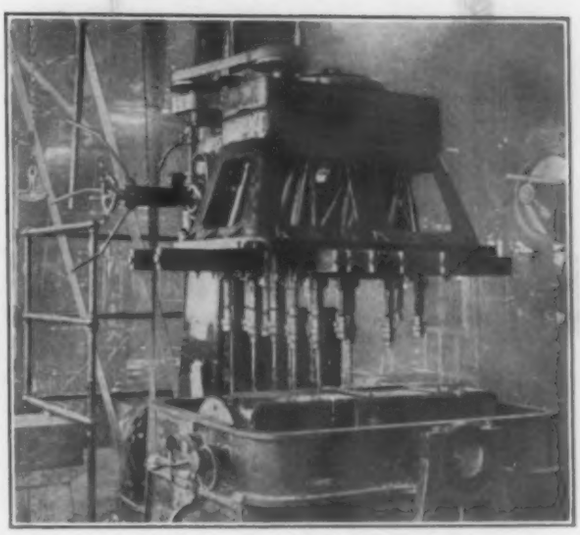
Two iron mixtures are used, the iron for the cylinder castings being made from a charge of high silicon, high manganese pig with some charcoal iron and 20 per cent of steel scrap, the regular mixture running lower in silicon and containing from 10 to 12 per cent scrap. The high cutting speeds of the machine shop also have a bearing on the iron mixture used. The cupola, lined down to 62 in. from a 90-in. shell, has a continuous tuyere and melts at the rate of 20 tons per hour. The pouring of the cylinder iron is begun about 14 charges back and is again followed by the regular mixture to finish the heat. To facilitate the removal of the cupola drop following a heat, a heavy cast-iron fan-shaped rake is laid on the floor under the cupola. The bottom is dropped on this and hauled out after cooling.

The coremaking department is installed along a portion of one side of the foundry building. The coremakers' benches are placed along the wall under the windows, but the core ovens are of necessity at the extreme end of the coremaking section. To reduce the time loss in transferring the cores from the benches to the ovens, the several carrier trays were installed for operation along the overhead trolley, as shown in the illustration. The green cores, when made, are placed directly on one of these trays, which can be spotted within reach of any of the benches, and when the carrier is full transferred by a helper to the ovens. The ovens are the drawer type, built by the Central Iron Works, and are coke fired from the rear, outside of the building.

Both in the foundry and machine shop the piece-rate method of wage payment, with but one or two exceptions, prevails for all work. The night gang which shakes out the molds from the day, cleans up the floor and cuts over the sand for the next day with a power sand-cutting machine, is paid by the hour. But such work as the lining of the ladles, patching of the cupola and charging of the cupola,



The Tooling on a King Vertical Turret Lathe for the Complete Machining of Flywheels Which Enables Metal To Be Removed Rapidly

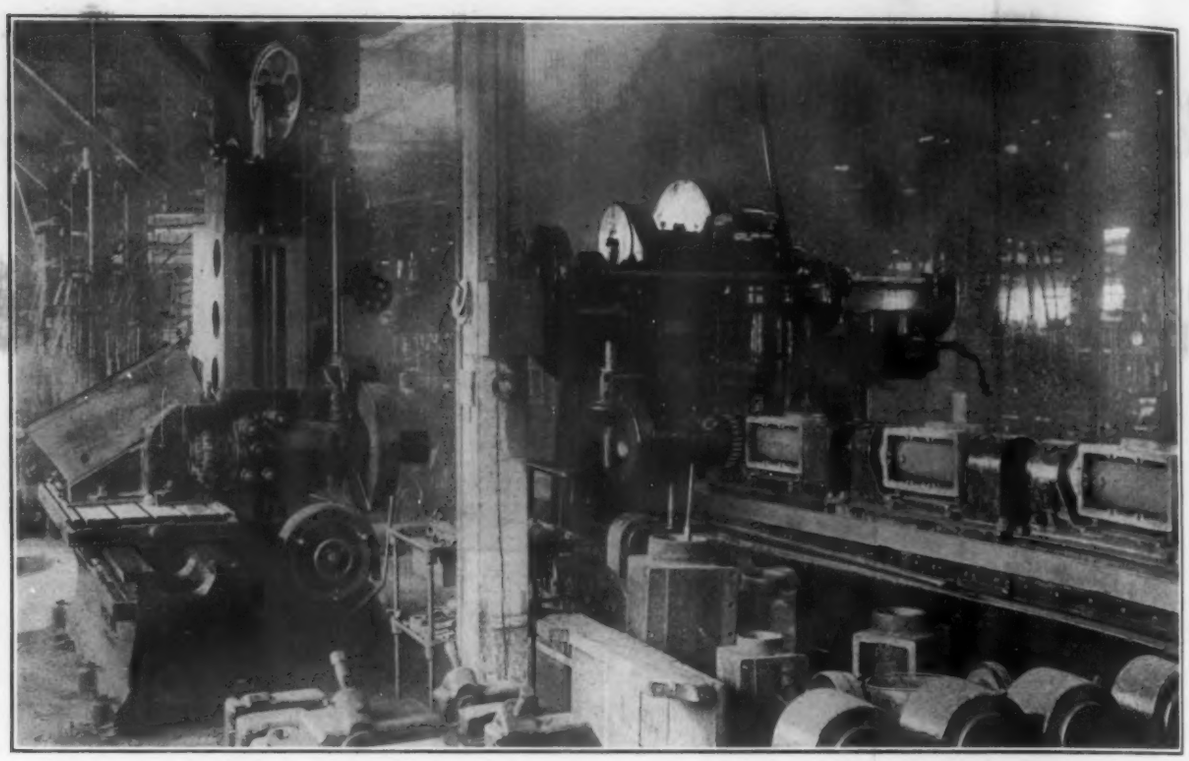


A Flexible Fixture Used To Enable All the Holes in the Large Engine Bases To Be Drilled

are all on a piece-rate basis at so much per ton melted, as for example, the two men lining ladles receive 5c. each per ton of iron poured. In the machine shop all of the jobs have been timed and rigged up for piece-rate schedule, though the speeds and feeds approximated as correct for the job are not rigidly fixed and are subject to the judgment of the operator in crowding or easing up on the rate of cutting, as the particular casting may suggest. The operators are paid only for good work, where defects are chargeable to them, and the payroll is made up not from the count of the pieces at the machine as they are molded or machined, but as the work passes the inspection department, each operation involved in the complete job being there credited to the man regularly performing it.

The arrangement of the several departments of this shop, as indicated in the floor plan, provides for a straight-line layout. From the foundry the castings go directly to the cleaning room, thence through the machine shop to the finished parts stock, to the parts assembly, final assembly, testing room, paint shop and warehouse. In the machine shop the principal machining jobs have their several operations flow in the same directional sequence in parallel lanes from the cleaning room end. Some of this work may be briefly followed as typical examples. In the first operation on the bases of the 5-hp. engine the beds are set up singly on an Ingersoll planer-type milling machine, and at that setting the ends of the main bearings, the bosses on which the cylinder rests, the top and inside of base, in all nine different surfaces, are faced off with a production of about 60 a day. The casting is then moved forward to another Ingersoll milling machine, where, mounted on an angle fixture which offsets the angle of the main bearings, these bearings are milled out. The nature of the operation is clearly shown in the illustration.

In the background of this engraving the multiple-spindle drilling machine can be seen, on which the following operation is performed. This is shown in detail, a job that is interesting largely because of the fixture which makes it possible to drill the 20 variously located holes in the base with one handling of the casting. The casting is hung in the fixture frame so that it can be rotated in a horizontal axis by the hand crank and gear, while the frame itself rotates on the central trunnions in a manner to tilt the casting up at any desired angle. The fixture in addition is mounted on a short track which permits it to be pulled out from



The Second Operation on the Bed, That of Milling Out the Bearings, Is Shown at the Left, While the Multiple Mounting of Cylinders on a Planer Type Milling Machine for Facing All External Bosses and Flanges Is Illustrated at the Right

under the drills. In this latter position the casting is put in place, the fixture tilted and pushed in toward the machine far enough to drill the holes in the bearings. A pneumatic hoist is available for tilting the fixture, which is then pushed all the way in and eight holes in the top side drilled, after which the base is rolled over on either side for the drilling of the remaining holes. The drill spindles are fitted with quick-change chucks and a helper is changing the drills while the machine operator adjusts the fixture. After the drilling, the base is put on an adjoining Bickford radial drilling machine for tapping the necessary holes, an inclined stand being used for tapping the holes for the bearing-cap cap screws.

In finishing the cylinders the first operation is that of boring. The 9 and 12 hp. sizes are put on horizontal boring mills, one of the type built by the Binsse Machine Tool Company, Newark, N. J., and the other by the Barrett Machine Company, Meadville, Pa. One operator attends both machines and the cylinder is rough and finish bored, then reamed and the end faced off. The smaller 5 and 7 hp. cylinders are finished in three successive operations on the three spindles of a Foote-Burt gang drilling machine, a similarly rigged Baker high-speed gang drilling machine finishing the 2-hp. cylinders. The machining of the external surfaces of the cylinder casting, including the pedestal, side bosses and water reservoir flange, is also illustrated. At the right of this view is shown an Ingersoll milling machine with a long bed and table. The larger cylinders are mounted five at a time in the special fixtures, as shown on the machine and in the foreground. This machine is fitted with two vertical spindles and two horizontal opposed spindles. About 45 min. is required for the complete set-up, the machine operator having a helper to handle jigs and castings. A pneumatic hoist is conveniently at hand. The water reservoir flange that rests on the cylinder is ground on a Safety Emery Wheel Company grinder.

The head end of the cylinder is faced off on an Ingersoll vertical milling machine, while all of the drilling of holes in the cyinder casting is accomplished with the mounting of the casting in a fixture consisting essentially of a hinged plate to which the casting is fastened. In this way the casting is held rigidly to be drilled either for a vertical or horizontal hole, the hinged plate swinging through a 90-deg. angle in a vertical plane.

In the case of the smaller engines, as the 1½-hp. size, the cylinder and base are one casting. The cylinder is bored and the end faced in a turret lathe, the casting being locked in a suitable jig, the several operations including rough boring, finishing and reaming, a roughing and finishing cut over the end face and the champfering of the open end. In addition to running the turret lathe, finishing about 50 castings daily, the operator helps the horizontal boring mill man opposite him in the handling of the heavier cylinder castings. The bearings are then babbitted, the side bosses milled, the base drilled on a multiple-spindle drilling machine, the holes in the side drilled on a Cincinnati upright drilling machine and tapped on an American radial, leaving only the name plate holes to be pushed through with a sensitive drilling machine.

All of the above work progresses along either side of the main aisle of the shop, where the work can be easily handled to and from the machines. The transfer of work from machine to machine is not separated into a distinct function. Generally speaking, one machine is close enough to the other on which the next operation is performed so that the second operator can conveniently pick up where the first laid down, enough space being reserved for a working supply of stock. In the operations of finishing the cylinder-heads this method is particularly distinct. The facing of the heads is done on a Le Blond heavy-duty lathe with a turret tool post, and in the case of the smaller heads, on a Gisholt turret lathe. They are then drilled on Fox multiple-spindle and Rockford Drilling Machine Company two-spindle drilling machines and tapped on a Baker heavy-duty drilling machine, all of the operations being at high speeds. These several machines are in a row along an aisle and between

each is a platform, elevated perhaps 10 in. from the floor and within easy reach of either machine, on which the work in process is piled, each operator being thus enabled to handle the stock without loss of time.

The policy of this shop in the matter of keeping up the production rate is to depend not so much upon a highly organized division of tasks as upon rigid tools that will stand high cutting speeds and heavy feeds, upon the pressure of the work as it flows through the shop and the incentive of wages proportionate to the amount of good work turned out. An interesting example of tooling and a high rate of metal cutting is illustrated. The flywheels are finished almost completely in one setting on King Machine & Tool Company vertical turret lathes, using a feed of ⅜ in. and a speed of 40 ft. per minute. The tooling for this job is apparent from the illustration. The two tools in the turret head face off the end of the hub and the boss shown on the left of the wheel, while the two roughing tools in the side head finish the top and bottom faces of the rim. While the rough and finish boring tools and the reamer in the turret head are then finishing the hub of the wheel, the side head is moving in and the center tool scrapes the face of the pulley. This job represents an excellent test of the stiffness of the machine used.

While automatic machines and Potter & Johnson lathes are used on small pieces, including gear blanks and small pulleys, and Jones & Lamson flat turret lathes for bar work, one operator running as many as four machines, the pistons are turned up on a standard lathe, the set-up time for this job on an automatic machine having been found disproportionate to the actual machining time, as the work can be done on a lathe. A roughing cut is taken over the piston with ⅛-in. feed, followed by a second cut with ¼-in. feed. The surface is then worked over with a scraping tool and the ring seats roughed out. The ring seats are finished with a roughing and finishing cut, one cut being taken down the side of the seat on all except the top seat, which is given an additional surfacing.

In the control of the above detailed operations and the various others which make up the whole work of the shop, the management has apparently sought to avoid an excess of system. The direct method of accomplishing results and performing functions is encouraged. The absence of restrictive routine in the shop system is illustrated in the finished-parts stockroom. The finished parts from the machine shop, after being checked through the inspection into stock, are brought together in partial assemblies. The assemblers are not required to requisition the necessary materials from stock, but take what they need, the stock being readily accessible to them. With the other checks upon materials, and the incentive which the assembler has to keep his production up, no trouble has been experienced in loss of materials, and as no attempt is made to keep detailed costs at each step in the manufacturing operation, there has appeared little occasion for taking out the stock on an O. K'd charge ticket system. And in this general attitude much of the effectiveness of the shop organization is believed to lie.

The Danville Structural Tubing Company, Danville, Pa., is stated by a local paper to have been sold to C. S. Wagner and S. C. Rebman, who intend to make the plant much larger. Mr. Wagner is a nephew of Charles M. Schwab and is a graduate of Lehigh University, class of 1915. He will be president and general manager of the company and Mr. Rebman will be vice-president and treasurer.

BRITISH STEEL EXPORTS

July Shipments Large Despite Restrictions—Total Now Less than American

Exports of iron and steel from Great Britain in July, made up mostly of supplies sent to the Allies, were 298,929 gross tons, excluding iron ore and including scrap. This total ranks third for 1916, that of May having been 395,750 tons, with the average for the first six months 313,864 tons. The 1915 average was 270,858 tons.

July pig-iron exports were 62,914 tons (53,017 tons going to France), against 66,150 tons in June and 61,803 tons in July, 1915. To Aug. 1, 1916, the total pig-iron exports were 503,617 tons, as compared with 188,327 tons to Aug. 1, 1915. Of the former total, France took 320,910 tons and Italy 87,330 tons, with 21,075 tons credited to Japan.

Ferromanganese exports in July were only about 7000 tons, against 16,000 tons in July, 1915. To Aug. 1, 1916, they were 74,000 tons, against 57,000 tons to Aug. 1, 1915.

Steel-bar exports in July were 45,584 tons (36,783 tons going to France), against 39,574 tons in July, 1915. The total to Aug. 1, 1916, was 406,950 tons, as compared with 268,126 tons to Aug. 1, 1915. France has taken 345,538 tons of the former total.

Rail exports to Aug. 1, 1916, were 31,763 tons, compared with 157,190 tons to Aug. 1, 1915. Galvanized sheet shipments continue about one-half of last year's. In July they were 10,382 tons, against 10,861 tons in June. To Aug. 1, this year, they were 95,216 tons, against 198,549 tons in the same period in 1915. Exports of tin plates continue practically unchanged at 38,174 tons in July, against 30,351 tons in June and 39,528 tons in July, 1915, with the total to Aug. 1, 1916, at 226,772 tons, against 237,863 tons to Aug. 1, 1915.

July imports of iron and steel, excluding iron ore and including scrap, were 83,186 tons, which compares with 86,303 tons in May, the record for 1916, but still considerably below the 1915 average of 107,944 tons per month.

Imports of blooms, billets and slabs in July were only 10,898 tons, comparing with 11,223 tons in June and 62,568 tons in July, 1915. To Aug. 1, 1916, they were only 86,894 tons, against 269,857 tons to Aug. 1, 1915. The United States supplied 67,188 tons of this year's total, against 208,271 tons last year.

Iron-ore imports were large in July, 748,029 tons, making the total to Aug. 1 this year 4,137,609 tons, compared with 3,666,789 tons to Aug. 1, 1915.

The valuation of the exports for the first eight months of the year is given as £34,788,653, against £22,127,916 for those to Aug. 1, 1915.

It is interesting to note that while for many years British iron and steel exports were much larger than those of the United States, the average for this country to July 1, this year, was 436,000 tons per month, against an average for the seven months to Aug. 1 of 312,000 tons per month for the British exports.

Exports of Grecian Magnesite

Magnesite shipments from Greece in 1915 are given by U. S. Consul General A. W. Waddell of Athens as follows, in metric tons:

To	Raw	Calcined
England	43,545	7,627
United States	33,641	6,318
France	13,375	4,331
Netherlands	1,750	350
Greece	350	100
Total	92,661	18,726

All Grecian magnesite mines are located in the Athens district, most of them being on the island of Euboea. In 1914 the mines produced 117,430 metric tons of raw magnesite. The total 1915 output is placed at 133,858 tons. The United States bought more heavily in 1915 than formerly.

Building the New Navy a Serious Problem

Government and Private Yards Are Already Overrun with Work and Labor Is Scarce —Farcical Labors of the Shipping Board

WASHINGTON, D. C., Sept. 5, 1916.—The Government of the United States is now facing one of the greatest industrial problems it has ever been called upon to solve. A way must be found to secure the speedy construction of 68 warships, the immediate building of which is authorized by the naval appropriation act just signed by the President, and at the same time the newly-created Shipping Board must go into the market to buy or build $50,000,000 worth of merchant vessels. Instead of being able to pick and choose between a score or more of private shipyards eagerly competing for desirable work, the Government now finds itself obliged to appeal to the patriotism of the managers of a few yards, all of which are crowded with work that will keep them busy for 18 months. Owing to the short-sighted economy of the Secretary of the Navy in rejecting bids for vessels heretofore authorized, on the ground that they were exorbitant, although it is now freely conceded, in the light of recent market tendencies, that the competitors barely protected themselves in their proposals, the navy yards of the country are unable to come to the rescue, and Government officials must rely, in meeting a grave emergency, upon the public spirit of the men they have so freely abused.

The Navy Department has issued an advertisement calling for proposals for the construction by contract of 57 of the 63 vessels included in the first installment of the three-year naval program just authorized by Congress, the bids to be received until 12 o'clock noon of Wednesday, Oct. 25. These include 4 so-called dreadnaughts (battleships Nos. 45-48), 4 scout cruisers (Nos. 4-7), 20 torpedo boat destroyers (Nos. 75-94), and 29 submarines (Nos. 78-106). Confidential circulars for the information of bidders, and plans and specifications relating to the vessels, are ready for distribution, but, following the usual policy of the department, will not be made public.

A BLUNDERING NAVAL POLICY

In planning the expansion of the navy on the basis of the new appropriation act, the construction bureaus estimate that all of the ships authorized to be started this year should be completed by 1919. Inasmuch as the designs of nearly all the vessels have been fully worked out by the naval architects, and the plans and specifications are ready for the builders, the question of chief concern now is as to the private shipbuilding facilities which will be placed at the service of the Government at this time. It is, of course, assumed that eventually the Government's naval expansion program will induce existing private yards to expand, and possibly will tempt private capitalists to establish additional plants, but officials of the Navy Department are frank enough to state that thus far there has not been the slightest intimation from any responsible quarter that any such development may be counted upon. On the other hand, the practical men of the department now realize keenly that the policy of Secretary Daniels in not only rejecting bids of private shipyards which it is now admitted were reasonable, but also publicly censuring them for "seeking to compel the Government to pay extortionate prices for much-needed warships," has cooled the ardor of more than one prospective bidder and caused private shipbuilders generally to think twice before investing money in additional facilities available chiefly for naval work.

The blundering policy of the Secretary of the Navy with respect to his treatment of the big shipyards in the matter of the construction of the dreadnaughts authorized a year ago is now clearly disclosed, especially in its bearing upon the ability of the navy yards to help out on the new construction program. When, after rejecting bids of private shipyards, the dreadnaughts California and Tennessee were allotted for construction to the Government yards, the California to Mare Island and the Tennessee to the New York navy yard, the Navy Department overloaded both those establishments for many months to come. Although the plans of the Tennessee were completed a year ago, her keel has not yet been laid at New York because of the delay in completing the New Mexico. As the Mare Island yard lacked a slip adequate to take the California, it was found necessary to construct one specially for the purpose; hence, preparations for the building of both of these dreadnaughts are now taxing the facilities of the two yards. Secretary Daniels is said to have been exceedingly anxious that two of the new dreadnaughts authorized by the 1917 naval appropriation act should be built in the Eastern navy yards, but has reluctantly abandoned this project, as the only two yards capable of doing the work will be fully occupied for more than a year.

LARGEST AND FASTEST CRUISERS

According to a memorandum issued by the Navy Department, the four new dreadnaughts about to be contracted for will have the following chief characteristics: Displacement, 32,600 tons; speed, 21 knots; main battery, eight 16-in. guns; secondary battery, 18 5-in. guns, four 3-in. anti-aircraft guns; complement officers and men, 1022.

The scout cruisers are designed to be the largest and fastest vessels of this class ever laid down for any navy. Their characteristics will be: Displacement, 7100 tons; speed, 35 knots; length, 550 ft.; beam, 55 ft.; armament, eight 6-in. guns, four torpedo tubes and two 3-in. anti-aircraft guns; complement, 330. A distinct departure for vessels of such powerful type will be their complete equipment for carrying, launching and operating the largest-sized hydro-aeroplanes.

The hospital ship will be the first vessel ever built specially for this purpose for the United States Navy, those now in use being converted merchant ships. Every feature of an up-to-date and complete hospital will be embodied in the ship, which will have accommodations for 500 patients. Its displacement will be 9800 tons, length 460 ft., beam 60 ft. 10⅛ in., draft 19 ft. 6 in., and speed 16 knots. Under the terms of the Geneva convention, which makes hospital ships immune from capture or attack, the vessel will carry no armament, either for offense or defense.

The gunboat will be of a type specially designed for service in tropical waters, and of light draft for use in shallow rivers. Its characteristics will be: Displacement, 1575 tons; length, 241 ft. 2 in.; beam, 41 ft. 2½ in.; draft, 11 ft. 4 in.; armamen', three 4-in. guns, two 1-pounder guns, four 30-caliber machine guns, two 3-in. field guns, two 3-pounder guns; speed, 12 knots; complement, 149.

LABOR SCARCITY A PROBLEM

Another feature of the present industrial situation is causing the officials of the Navy Department no little anxiety, namely, the scarcity of skilled labor. The high wages and exceptional opportunities for the promotion of especially skilled men offered by the munition makers of the country have made heavy drafts upon all the manufacturing establishments of the Government, especially upon the arsenals and navy yards. The private shipyards have also suffered to some extent, but the greater flexibility of their employment systems as compared with the hard and fast rules of the Government yards has enabled them to keep their best men and

to develop inexperienced employees for special purposes with great rapidity. The preparations for the construction of the dreadnaughts California and Tennessee at Mare Island and New York respectively have been greatly delayed by the lack of skilled labor, and it will be a month or more before either of these vessels is laid down. Several months ago the department undertook to hasten the work on the New Mexico so as to clear the ways for the Tennessee, by putting on double shifts, but this project had to be abandoned, and it has taxed the employment bureau of the yard to keep a single shift going.

Present conditions in the American shipbuilding industry, taken by and large, reduce the immediate program of the Shipping Board created by the enactment of the Alexander bill to a mere academic problem. Under normal conditions, $50,000,000 would purchase so small a tonnage of efficient merchant vessels as to produce little or no effect upon the commerce of the country. At the present time, when the average seaworthy vessel is able to earn her entire cost in a single voyage, it is obvious that the Shipping Board, if it is to buy ready-built vessels, must pay prices representing an almost criminal waste of the people's money. On the other hand, with shipyard prices at top-notch figures, any construction program must be almost equally extravagant, and cannot be carried through on a basis of deliveries that will tend in any degree to relieve the situation that will prevail until the end of the European war. It is a curious anomaly that no matter what policy the Shipping Board may pursue, it can be of little or no assistance to the commerce of the country until after the crisis is past, and then only at a cost that will appear little short of mountainous in view of the conditions that will prevail almost immediately after the cessation of hostilities in the great European conflict. W. L. C.

Pollak Steel Company Adds South Chicago Plant

The Pollak Steel Company, which has operated an axle and forging plant at Cincinnati for a number of years, has purchased the plant of the Willard Sons & Bell Company, South Chicago, Ill., and will manufacture axles and forgings there also, the plant being started up on Aug. 28. Within the past year the plant at Cincinnati has doubled its capacity by the addition of buildings and machinery. At present 1500 men are employed at Cincinnati, and the company will shortly employ about 500 at South Chicago, making a total of 2000. The combined forging and axle output at the two plants is estimated at 30,000 tons per month, and both are booked for several months.

Rodney D. Day, formerly general manager of sales of the William Tod Company, Youngstown, has been appointed assistant to the vice-president, with headquarters at Cincinnati. He will be in charge of all operations at the plants at Cincinnati and Chicago. Frank Dunbar, formerly Western sales manager for Brown & Co., Pittsburgh, formerly connected with the mechanical department of the Missouri Pacific Railroad and with the Scullin-Gallagher Company, has been appointed district manager of the plant at South Chicago, with headquarters there. Sales in the Chicago district will be under the jurisdiction of Frank W. Graves, Railway Exchange Building, Chicago, who has been Western sales manager of the company for a number of years.

The Noble Electric Steel Company's plant at Heroult, Cal., has been in steady operation since April 15, most of the time on ferromanganese, with occasional runs on ferrochrome and pig iron. Manganese ore has been coming in slowly, but is now in better supply, being received from several sources.

The Sugarman Iron & Metal Company, old metals, has taken a five-year lease on a lot on Brannan Street, near Fifth, San Francisco, Cal.

Willamette Works Adding Large Boiler Shop

Construction of another boiler shop is under way at the plant of the Willamette Iron & Steel Works, Portland, Ore., which will increase its facilities for building boilers 100 per cent. The new shop is 50 x 500 ft., and it adjoins the main shop in which boiler work has been carried on previously. When the new building has been finished and put in shape for service the plant will have, it is claimed, the largest strictly boiler shop on the Pacific coast. The new building and alterations will represent an outlay of $30,000. The equipment, which will cost $75,000, will consist of a 20-ton traveling crane, an 18-burner oil-plate furnace, a set of bending rolls, and two high-powered, high-speed radial drills. The rolls will be capable of bending a plate 1⅝ in. thick. The plant is expected to be in operation by Oct. 1. It will be possible to work on nine new boilers at a time.

Each of the five Norwegian steamers under contract at the Northwest Steel Company's yards in South Portland will be fitted with three boilers, making a total of 15 for the fleet. In addition to these, the Willamette Iron & Steel Works has a contract for the construction of six boilers of exactly the same size and type for two large offshore steamers being built by Eddy & Skinner, Seattle. These vessels, it is understood, will fly the Danish flag. The Willamette Works is also building eight digestors for various pulp and paper mills of the Pacific Northwest. Each is to be 16 ft. in diameter and 50 ft. high, and will carry a pressure of 250 lb. They will be made of steel plate 1¼ in. thick, each weighing 50 tons. This is wholly new work being done at Portland. Formerly all such contracts were awarded to Eastern firms.

Additions to Australia's New Steel Plant

In a recent report to the Australian Minister of Defense, G. D. Delprat, general manager of the Broken Hill Proprietary, Ltd., Australia's new steel plant at Newcastle, made the following statement outlining the position of the company as to its ability to supply iron and steel:

We are at present under obligation to supply 4000 tons of rails to the Commonwealth Government, and 3000 tons of rails to the New South Wales Government per month. The total production of steel at present is 6600 tons per month. We are adding 4 open-hearth furnaces, making a total of 7. At the end of this year our production of steel ought to be 11,800 tons per month. Our present rolling mill is only designed for rolling rails above 60 lb. and heavy structural steel. We hope to complete by the end of July an 18-in. mill, to roll lighter sections of rail and structural steel. By the end of the year we ought to be in a position to supply a very large proportion of the steel required in Australia. We have in hand between 30,000 and 40,000 tons of pig iron. We are not exporting any material, but are keeping all our products for Australia. The difficulty in getting machinery from America makes progress slower than it otherwise would have been. We have been supplying rolling mills in Melbourne with billets and blooms so as to keep them going. I note the suggestion that the government should assist us in increasing the works. I hope this may not be necessary, but if at any time the want of capital should interfere with the necessary extension of the works to keep Australia supplied, we will take the opportunity of discussing the whole position.

National-Acme Company to Build New Plant

The National-Acme Mfg. Company, Cleveland, Ohio, has acquired 14 acres at Eddy and Coit roads, on the Belt Line Railroad, and will shortly begin the erection of new factory buildings on this location. The company's present plant is inadequate to accommodate its growing business, and is hemmed in on all sides by other factories. It is the intention to continue to use the present buildings entirely for the machinery department and to remove the screw-machine products department to the new location. The company plans to erect as soon as possible one-story brick and steel buildings on the new site, covering about two acres of floor space.

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Triumphant Unionism

In a document addressed to his followers, made public on Saturday, Sept. 2, Samuel Gompers, president of the American Federation of Labor, called 1916 the best year of the trade-union movement. At the time his address was prepared the eight-hour railroad legislation was progressing toward enactment into law, and the belief that it would meet no serious impediment doubtless imparted much of the spirit of exultation to his utterances. He was thoroughly justified in making the claim he did for the pre-eminence of 1916 in trade-union achievements, but if his address had been delayed only a few hours he would have been able to indulge in still more triumphant language. He could then have claimed complete trade-union control over the greatest law-making body on earth—the Congress of the United States. Months before that, his cause had gained the favor of the President, who had shown a most willing disposition to assist any movement giving organized labor special privileges or immunities. The President's crowning opportunity to make his exact position known came when he appeared before the joint session of the two Houses of Congress last week in a plea for legislation to avert the threatened railroad strike and made himself virtually an attorney for the unions. The President, however, is but an individual. His submission to the union yoke was by no means so great a triumph for the cause as the abject surrender by the Senators and Representatives of the free commonwealths composing the august Government of the United States to the demands imposed by a combination of railroad workmen. Seldom has greater haste been shown in the enactment of important legislation. The union leaders cracked the whip and our rulers strained their muscles to pull the load through in the time set by the stop watch. Unionism is at last triumphant and the country must reap whatever consequences our new masters see fit to impose.

Unit vs. Blanket Bids on Castings

The first and most impressive disclosure made plain by the early summary sheets of a newly introduced foundry cost system is the number of factors previously unknown or obscured which are vital to the success of the business. A direct result of this discovery is usually a realization that the practice of making blanket quotations in the form of a pound rate upon a group of patterns is ordinarily unfair to both the foundry and the customer. Not only does it disregard fundamental factors affecting costs, but it is an incentive to one or both parties to lower their moral and business standards and employ questionable methods to prevent showing a loss.

Accurate cost records show the folly of the guesswork estimate which is well nigh inseparable from the blanket quotation. Almost without exception a good cost system shows that the profits anticipated by the foundryman from the heavier patterns of the group do not offset the losses from the lighter patterns. Furthermore, in many cases he discovers that the proportion of light castings on re-orders is growing steadily larger, owing to the increasing demand for repair parts on the machine which the customer has sold. Usually, too, the foundryman finds that he has deluded himself with the belief that a large volume of orders from a single account necessarily makes that customer's business profitable. The revelations of the cost system cause logical thinking and logical thinking underlies any advance in practice.

The activities of some foundry managers in correcting abuses revealed by cost records have been the topic of many profitable discussions at foundrymen's meetings in the past few months. In these discussions the subject of unit piece quotations has frequently produced the most heat, if not the most light, on this vexed topic. The impartial observer notes that the more a foundry owner has developed his cost system, the more sturdily does he insist that the unit quotation will remedy many of the existing evils.

In his argument he generally brings out these points: That the number of pieces in an order has a definite bearing on the cost per piece and consequently the quotation should include a range of selling prices based upon the number of pieces ordered. That many buyers by shrewdly (?) pitting one foundry against another in blanket bids cause frequent shifting of contracts from foundry to foundry, finally coming back to the first foundry and thereby completing a cycle in which everyone

concerned has lost money, including the buyer. That each successive foundryman, finding the contract unprofitable, has ultimately sidetracked this customer's work when more profitable work came in, thereby creating delays and other troubles which have often more than offset the cent or more per pound which the customer expected to save when accepting this foundryman's quotation. These are specimen arguments for quotations by the piece; the list could be extended.

When it comes about that all buyers realize that in purchasing castings they are not buying raw stock like bar steel but are really entering into a partnership with another manufacturer in the production of formed parts for their own products, then the foundry cost system will come into its own as a vital factor in reducing costs of all products in which castings are incorporated. Then selling prices of castings will be fixed upon a basis equitable to both seller and buyer; contracts will become more stable, and the foundryman will be encouraged to study the methods he employs to the end that he may retain his established trade by sharing with his customers the gains made by better foundry practices. To-day many a buyer is paying the prices necessary to make 10 castings a day by hand molding when, with a better understanding, more mutual confidence and more actual co-operation between them, the foundryman could so change his rigging and pattern equipment that 75 castings a day could easily be produced by machine molding.

Accurate cost accounting will light the way to the profitable manufacture of castings; and most buyers have learned that it is not good business to be a party to a contract that is not profitable to the seller.

The Puddler's Earnings

Under the present abnormal conditions, labor of all kinds in the steel trade is receiving the highest wage ever known. In sheet and tin-plate mills, the men have been making as much money in four days as they formerly made in six. In many cases they will work but four or five days a week, being fully satisfied with the earnings of the shorter week and having one or two days of idleness. The high wages ruling have led to some exaggerated statements, usually confined to the daily press, but the one quoted below is from a journal devoted to the metal trades:

> As an illustration of the position of operation in the mills, it may be noted that iron puddlers to-day are receiving $8.80 per ton, which is the highest rate in the history of the industry. Two and one-half tons is considered an average day's turn, so that a puddler is making at the rate of $22 per day. Because of the excessive hot weather, however, few of the puddlers have been able to work recently more than four days a week.

In the first place, under the scale of the Amalgamated Association, the men charge in a single puddling furnace about 550 lb. per heat and work five heats in a turn. If the puddler gets out his full allotment of puddled iron, it would mean 2750 lb. Under the present rate of $8.80 per ton of 2240 lb., the earnings for a turn would be not over $12. However, this does not all go to the puddler, as in the hot weather he has two helpers; but under existing rulings of the Amalgamated Association the term "helpers" has been allowed to disappear and the men are put on an equal basis as regards their earning power, the total money earned in a turn by a single puddling furnace being divided between three men, each receiving about $4 per turn when maximum output is secured. On a double puddling furnace, four men work in the winter and six men in the summer. The output of a double puddling furnace is about twice that of a single furnace, so that in the winter four men divide not over $24 per day and in the summer six men divide the same amount. If the output of a double puddling furnace in the summer and winter pays $24 per ton, each man would receive in the summer not over $4 and it rarely reaches that amount, while in the winter his earnings would be very little more than $6 per turn.

It has been said frequently that the puddler is probably the poorest paid wage-earner in the iron trade, considering his skill and his exertions. His work is hard, in the summer it is very hot and exhausting, and yet he does not make at the outside over $5 or $6 per day, and his average earnings would not be over $4 to $4.50 per day. On the other hand, sheet and tin mill hands whose work is much more comfortable on account of the modern facilities installed in many of the mills—notably plates on which the workmen stand and which are cooled by water, also the introduction of pipes through which cooled air is blown—are earning in many mills as high as $12 per day, and in some cases more. While the work of a sheet and tin mill roller or heater requires more skill than that of a puddler, yet the discrepancy in pay seems out of proportion. It is also said, and is no doubt true, that the hard work of puddling wears the worker down faster than sheet or tin mill rolling. To-day many men are working in bar-iron rolling mills as laborers who were formerly puddlers but are no longer able to do that work.

The Trade Commission No Issue

One might reasonably have supposed two years ago, when the Federal Trade Commission and other "trust" measures were being passed by Congress, that the trust subject would be a live one at the next quadrennial election. Such is very distinctively not the case. There are various issues, some clear cut and some quite otherwise, but one does not observe much excitement over the question whether the Federal Trade Commission should be abolished or should have its powers increased.

There is room for discussion, however. It is about two years since the law establishing the commission was enacted, and about a year and a half since the commission formally organized. The experiment has now been conducted for a sufficient length of time to permit of some opinion being formed. Thus far the commission has performed chiefly the function of a lecture bureau, and that work it has done well. Perhaps it has done all that it could do under the law. Business men have consulted their lawyers and have been given the unvarying opinion that the commission is without

legal power. The commission is evidently of the same opinion.

If the commission has in itself no legal power it should at least have influence with the law-making body which created it. The slowness of Congress to act upon its recommendation that the way should be cleared for business men to combine to extend foreign trade is no more creditable to Congress than most of its acts of omission or commission.

One may reasonably ask "What is the use?" If what has occurred or has not occurred in the past year and a half of the commission's existence is the measure or gage of what is to be expected from it, there is question whether it is worth while, although the lecture and other educational features are not without their merits. The Department of Agriculture, the Geological Survey and other branches of the Government all do useful educational work, and the Federal Trade Commission may be doing all that should be expected and no more, but it is rather remarkable that the question constitutes no issue at this time.

Nearly 20 years ago the Interstate Commerce Commission was established, also with powers limited, but not so limited as those of the trade commission. In its first year and a half it accomplished something, and the conduct of the railroads continued to be a live issue, whereby from time to time the commerce act was amended. It may be a trifle early to judge, but it does seem that the quieting down of the trust talk is an indication that the question was not such a great one after all, as two administrations would have the country believe.

There is one unfortunate suggestion, however, in the lack of results, Congressional and otherwise, in connection with the Federal Trade Commission, and that is that the establishment by Congress of a tariff commission might not bring about all that some of its advocates have hoped. To have that commission barren of results would be distinctly disappointing to business interests, when with respect to the Trade Commission business has offered no complaints. Results would not automatically follow the establishment of a tariff commission. Desirable as such a commission is admitted to be, it must not be taken for granted that it will remove the tariff question from politics. Those who have been so eager for that consummation should reflect on the evidence that working results of commission government bear a close relation to the powers conferred.

Iron a Barometer

There is such a disposition in some quarters to regard the activity of the iron and steel industry as being based chiefly upon the war demand for steel that it might be inferred that iron is not at this time the barometer of general trade; but the proposition can be defended that iron and steel activity is at this juncture as close a reflection of general trade activity as has been the case at various times in the past. The production of steel ingots is at a rate considerably more than 40,000,000 tons a year, against only 30,000,000 tons in 1912 and 1913, hitherto the best years, and the war demand for steel does not account for all of the excess tonnage.

Another and very important factor must be considered. There have been times when such general business activity as existed ran largely to new construction work, a line in which steel is particularly prominent. At such times the steel industry was more active than were many others, and if taken as a barometer it rather exaggerated the degree of general prosperity. At the present time the divergence is in the other direction. The employment of steel for strictly new construction is relatively small, and the consumption of steel for various miscellaneous uses, more directly and closely associated with the activities of the people, is relatively large.

The function of the barometer, however, is not to tell of an existing condition, but to furnish means for a forecast, and it may be inquired what light the state of affairs in the steel market throws upon the question how long the war is to last and how long business activity is to last. If one is to judge by the attitude of buyers of steel he may be confused, for some buyers are taking a decidedly conservative if not pessimistic view of the future of their particular lines if high prices for steel are to continue indefinitely. Others are buying with confidence. If we are to judge by the attitude of steel producers there is no occasion to be confused. The steel producers are engaged in new construction work on a large scale and prosecuting it when construction costs are extremely high. Some of the new capacity will be in service within a few months, but much of it not until the lapse of more than a year.

CORRESPONDENCE

Cost Method for Small Shops

To the Editor: Dr. William Kent, at the end of his interesting article on a "New Method of Determining Factory Costs," invites comment.

He seems to have demonstrated, with most direct reasoning, the fallacy of the direct labor burden. The system presented in the article is hardly applicable, however, to the small shop. When the capacity of a plant is not over 200 men, the duties of the so-called non-producers are multifarious. The cost clerk may also have charge of the patterns, the timekeeper may check invoices, and so on. It would seem wise, therefore, to eliminate the job cost by considering it a part of the man-hour cost. The material cost, if necessary, could be limited to storekeepers, transportation, elevator men and the interest items. It would seem advisable to reduce the variations in the machine-hour cost. Bench vises, foot presses, shears, etc., need not carry any power burden, this item being apportioned to all other machines. Thus you would have only two machine-hour rates.

As stated above, these modifications of Dr. Kent's proposed method are for the small shop only, the writer not feeling qualified to approach the subject from the viewpoint of a large plant. However, there are some general questions which suggest themselves. For instance, why is not the purchasing agent charged to materials. Should not a part of the watchman's wages be charged against machine cost? Of course, in many plants certain general expenses are kept as distinct from manufacturing costs as are selling expenses, and

Dr. Kent may have this in mind; but such an arrangement is only feasible when the size of the business warrants the carrying of costs to the utmost detail.

H. D. MURPHY.

The Percentage of Open-Hearth Steel

To the Editor: In the last issue of THE IRON AGE an article appeared under my name dealing with the history of the open-hearth furnace. The very last sentence contained an error. In the original manuscript I made the following statement: "Taking the records for 1913, which was the last normal year, we find that 60 per cent of all the steel came from open-hearth furnaces." This seems to be plain, but perhaps it would have been better if the following words had been added: "The remaining 40 per cent being made in Bessemer converters, including both acid and basic."

Some one in your office altered the wording so as to make the figures show the relative output of steel from acid and basic furnaces. No accurate information can be given on this point, for France, Belgium, Russia and other countries do not classify their open-hearth steel; but it will not be far wrong to say that 14 per cent of all the open-hearth steel produced in the world is made in acid furnaces, while 86 per cent comes from basic hearths.

H. H. CAMPBELL.

Wayne, Pa., Sept. 2, 1916.

Central Western Iron-Ore Rates Readjusted

Advance of 12 Cents to Monessen—With Deliveries at Gates of Yards, Mahoning Valley Furnaces Will Pay More than Before

WASHINGTON, D. C., Sept. 5, 1916.—The Interstate Commerce Commission to-day announced a revision of rates on iron ore from Lake ports to furnaces in Pennsylvania, Ohio and West Virginia, and of practices relating thereto, effective April 1, 1917. The net result, it is believed, will be the imposition of a greater burden on the industry than it now bears, notwithstanding the fact that the change is to be made in supposed response to complaints by the Youngstown Sheet & Tube, Wheeling Steel & Iron and Pittsburgh Steel companies, alleging present rates to be unreasonable and unjustly discriminatory.

If the commission follows up its report on these complaints with the necessary order, a complete change will be made in the method of stating rates on ore. Sharp advances on "dock" or "indirect" ore will result. Attempts will be made, it is known, to prevent disruption of the present rate structure by means of injunctions, but the outcome of these proceedings is uncertain.

As the matter stands, the Pittsburgh Steel Company, the chief complainant, instead of obtaining relief, will be compelled to pay 12c. more per ton for direct and 16c. or 18c. more for dock ore. That advance will follow the transfer of Monessen, where its plant is located, from the Pittsburgh rate group to the Johnstown group.

Nominally Youngstown retains its present rate on direct ore, namely, 56c., Pittsburgh receives a reduction from 88c. to 82c., and Josephine is advanced from 93c. to 94c. As a matter of fact, it is doubtful, in view of another change ordered by the commission—namely, that deliveries shall be made at gates of furnace inclosures instead of on trestles—whether Pittsburgh will have any reduction in charges at all. Youngstown, it is certain, will have its cost of getting ore to the furnace trestles advanced.

UNLOADING SERVICE SEPARATED

The report was written by Commissioner Harlan. That declaration is sufficient to indicate to those who are familiar with Interstate Commerce Commission matters that something unusual has been proposed. The commission's new project is that every ore rate shall be divided into three parts, each part representing a detail of the service. At present rates are stated so as to include the whole service of taking the ore from the "rail of the vessel" to the trestle of the furnace company. Commissioner Harlan's proposal, approved by the commission, is that the unified service shall be treated as three distinct operations, for each of which a charge is to be made. The first is to be a flat rate of 6c. per gross ton for unloading from ship to car. The second is for the rail haul from the dock to the furnace plant inclosure and the third is to cover the placing of the car on the unloading trestle. Stated in accordance with the new method, the rate from Youngstown, now 56c., including the whole service of taking the ore from the hold of the ship and placing it on the trestle ready for dumping, will be 6c. for unloading, 50c. for carrying from dock to furnace inclosure and a charge on an engine-hour basis for hauling the cars up the trestle. Inasmuch as the present whole-service rate to Youngstown is exactly equal to the sum of the proposed rates for unloading and hauling, it is obvious that the whole charge, after April 1, will be greater by the cost of placing the ore on the trestles.

In pursuit of the ideal, Commissioner Harlan thinks the practice of a railroad in "spotting" the cars on the trestle is vicious, because all railroads do not do it for their customers. Therefore, he holds, no road should be permitted to perform this service. When this regulation goes into force, switching for furnaces will not be in accordance with the rule approved by the U. S. Supreme Court in the Los Angeles switching cases, which was that the rate shall include the ordinary service of setting a car on a private or company track, convenient for loading, hauling it to the destination community and there placing it upon a company or private track "convenient for unloading."

The groupings of Lake ports as points of origin and of furnace towns as groups of destination are also to be changed. None, however, results in such penalties as that which Monessen must suffer. The destination groups and distances are to be as follows: Youngstown to include furnace points from 50 to 74 miles from the lake; Leetonia, 75 to 99 miles; Midland, 100 to 124 miles; Pittsburgh-Wheeling, 125 to 159 miles, and Monessen-Johnstown, 160 to 199 miles. Monessen is 162.5 miles from the lake. That slight excess of distance will cost the Pittsburgh Steel Company 12c. a ton on its ore.

DIRECT AND DOCK ORE

Dock ore at present bears a rate of from 8c. to 10c. greater than direct ore. The rate on dock ore is also to be stated so as to show its components. The railroads which own the unloading devices are to charge 16c. for taking the ore out of the ship and depositing it in a stock pile and 10c. for taking it from the stock pile to the car. That means a net increase of 16c. in dock ore that now pays 10c. more than direct ore and of 18c. in the case of ore that costs 8c. more than direct ore.

A positive order respecting these changes is to be issued in time to enable the carriers to make them by April 1, or a month before the lake navigation season opens. No order will be made respecting deliveries beyond the gates of the furnace enclosures. The testimony showed, Commissioner Harlan thinks, that it would not be just to arrange that compensation on the per-ton basis. He points out that the expense to the

carrier for making deliveries "at convenient points for unloading" consists of assigning engines and crews to place a draft or drafts of cars on the trestles and that each engine can haul more cars than it is usually called upon to push up the incline. Therefore, the suggestion is that the charge be on the engine-hour basis; that is, the furnace is to pay according to the number of hours it uses an engine and crew, regardless of the number of tons of ore handled. This innovation, in the eyes of those familiar with the commission's rulings, is in conflict with its consistent pronouncements that the carload is the proper unit for measuring rates and not the trainload, as large shippers have proposed and as various railroads have approved.

RAILROAD EQUALIZATION CALLED VICIOUS

According to the report, the effort heretofore made by the railroads to equalize the cost of assembling the raw materials used in making pig iron is vicious and has utterly failed, hence the commission's determination to try something else. How the new system of rate making will work out remains to be seen.

Dissenting from the findings of the majority, Commissioner McChord asserts there is nothing in the record justifying the advance in rates for the Monessen furnaces. He also points out that the average loaded car-mile revenue to the Pittsburgh-Wheeling district under present rates is 27c.; to Pittsburgh proper, 32.9c.; to Monessen, 25.7c., and to Johnstown, 21.2c., while to DuBois-Punxsutawney it is 16.3c.; to Hamilton-Wellston (Ohio), 11.3c., and to Ashland-Ironton (Ohio and Kentucky), 13.2c. He figures that on the basis of the average tonnage hauled during the period 1909-1914, the revenue of the carriers, under the rates to be made effective in April, will be $50,000 greater annually than at present, even without considering the revenue that will result from the extra charge for trestle delivery. Nearly 25,000,000 tons is involved. Fifteen cents per loaded car-mile is deemed a remunerative rate. Commissioner McChord also criticises his colleagues for keeping up rates to the central district (southwestern Pennsylvania, southeastern Ohio and northern West Virginia), while leaving rates to the western (southwestern Ohio) and the eastern (Punxsutawney and DuBois) at their present levels, which are low in comparison with Pittsburgh-Wheeling. W. L. C.

Hearing on Iron and Steel Export Rates

A number of iron and steel manufacturers will appear before the Board of Suspension of the Interstate Commerce Commission on Monday, Sept. 18, in reference to the proposed withdrawal of export freight rates on iron and steel articles effective Oct. 1, 1916. The Pollak Steel Company, Bernard E. Pollak, treasurer and general manager, has submitted a statement to the Interstate Commerce Commission in opposition to the change, contending that the domestic freight rate to the seaboard is too high and that in case the export rate is withdrawn the domestic rate should be lowered. Copies of this brief will be furnished other shippers desiring them.

The steel trade in California is taking a keen interest in electric furnaces, and several new installations will give an opportunity for a close comparison of performances. Since the installation of a Heroult furnace by the Monarch Iron Works at Stockton, Cal., the Samson Sieve-Grip Tractor Company of that place has ordered a Rennerfelt furnace of ¾ ton capacity, which will start up in October. The Enterprise Foundry, San Francisco, is building an electric furnace of its own design, the work being under the supervision of its electrical engineer and the superintendent of the steel-furnace department. The transformer installation for this plant has been ordered from the Allis-Chalmers Company.

The Chicago Bridge & Iron Works, Chicago, Ill., has opened an office in the Florida Life Building, Jacksonville, Fla. Sales in the states of Georgia, Florida and Alabama will be handled from this office, which will be in charge of Elwood G. Ladd.

Papers to Be Read at Foundry Meetings

The papers to be read at the technical sessions at 10 o'clock on Tuesday, Wednesday, Thursday and Friday mornings,, next week, at the foundry convention in Cleveland, particularized by groups and as regards special features, elsewhere in this issue, are as follows:

Tuesday, Sept. 12.

Symposium on "The Results of Closer Co-Operation Between the Engineer and the Foundry," as relating to:

"Gray Iron," by D. W. Sowers, Sowers Mfg. Company, Buffalo.

"Steel," by John Howe Hall, Taylor-Wharton Iron & Steel Company, High Bridge, N. J.

"Malleable Iron," by G. F. Meehan, Ross-Meehan Foundries, Chattanooga, Tenn.

"Non-Ferrous Metals," by C. E. Chase, Modjeski & Angier, Chicago.

Symposium on "The Influence of Gating on Castings," covering:

"Gray Iron," by B. D. Fuller, Westinghouse Electric & Mfg. Company, Cleveland.

"Steel," by William Gilmore, Hubbard Steel Foundry Company, East Chicago, Ind.

"Malleable Iron," by A. M. Fulton, Fort Pitt Malleable Iron Company, Pittsburgh.

"Non-Ferrous Metals," by R. R. Clarke, Pennsylvania Lines West, North Side, Pittsburgh.

"Waste Foundry Sand," by H. B. Swan, Cadillac Motor Car Company, Detroit, and H. M. Lane, consulting engineer, Detroit.

"The Significance of the Fire Waste," by Franklin H. Wentworth, secretary, National Fire Protection Association, Boston.

"What the Pratt Institute Has Done, Is Doing and Hopes to Do, in the Training of Men for the Foundry Industry," by Samuel S. Edmands, Pratt Institute, Brooklyn.

"Analyzing Foundry Operations as a Basis for Improvement in Shop Conditions," by R. E. Kennedy, University of Illinois, Urbana, Ill.

"Foundry Work at the University of Nebraska," by John Grenman, University of Nebraska, Lincoln, Neb.

Wednesday, Sept. 13

Report of A. F. A. Committee on Foundry Costs, by B. D. Fuller, chairman.

"Foundry Costs," by Clinton H. Scovell, Clinton H. Scovell & Company, Boston.

"Profit-Sharing as a Factor in Preparedness," by C. E. Knoeppel, C. E. Knoeppel Company, New York.

Report of A. F. A. Committee on Foundry Scrap, by G. E. Jones, chairman, Whiting Foundry Equipment Company, Harvey, Ill.

Report of A. F. A. Representatives on the Conference Board on Training Apprentices, by B. D. Fuller.

Report of A. F. A. Advisory Committee to the United States Bureau of Standards, by Richard Moldenke, chairman, Watchung, N. J.

"How Some Cleaning Room Problems Have Been Solved," by H. Cole Estep, *The Foundry*, Cleveland.

"The Introduction of the Molding Machine in Foundries," by A. O. Backert, Penton Publishing Company, Cleveland.

Brass Foundry Session:

"Twenty-five Years' Experience in the Brass Foundry," by E. A. Barnes, Fort Wayne Electric Company, Fort Wayne, Ind.

"Evolution of the Die Casting Process," by Charles Pack, Doehler Die Casting Company, Rochester, N. Y.

"How a Large Manufacturing Concern Disposes of Its Old Metal," by J. M. Bateman, Western Electric Company, Cleveland.

"The Reclamation of Brass Ashes," by Arthur F. Taggart, Hammond Laboratory, Yale University, New Haven, Conn.

"The Small Leaks of a Brass Foundry," by Charles T. Bragg, Ohio Brass Company, Mansfield, Ohio.

"The Application of the Oxy-Acetylene Welding Process in the Repair of Defective Non-Ferrous Castings," by S. W. Miller, Rochester Welding Company, Rochester, N. Y.

"Alloys to Withstand Internal Air Pressure," by S. D. Sleeth, Westinghouse Air Brake Company, Wilmerding, Pa.

"Making Thin-Walled Castings," by R. S. B. Wallace, National Cash Register Company, Dayton, Ohio.

Thursday, Sept. 14.

Steel Session:

Symposium on "Electric Furnace Practice."

"The Ideal Electric Furnace for the Steel Foundry" by F. J. Ryan, E. B. McKee and W. D. Walker, Snyder Electric Furnace Company, Chicago.

"The Electric Furnace in the Foundry," by E. B. Clarke, Buchanan Electric Steel Company, Buchanan, Mich.

"Gronwall-Dixon Electric Melting and Refining Furnace," by John A. Crowley, John A. Crowley Company, New York.

"Electric Furnace Practice in the Manufacture of Steel Castings," by T. S. Quinn, Lebanon Steel Foundry, Lebanon, Pa.

"Electric and Converter Steel Compared," by Peter Blackwood, Blackwood Steel Foundry Company, Springfield, Ohio.

"The Manufacture of Manganese Steel Castings," by W. S. McKee, American Manganese Steel Company, Chicago.

"The Presence of Alumina in Steel," by G. F. Comstock, Titanium Alloy Mfg. Company, Niagara Falls, N. Y.

Malleable Session:

"The 25-Ton Air Furnace," by F. C. Rutz, Rockford Malleable Iron Works, Rockford, Ill.

"What Is the Normal Fracture of Good Malleable Iron?" by Enrique Touceda, Albany, N. Y.

"The Commercial Side of the Malleable Iron Industry," by W. G. Kranz, National Malleable Casting Company, Cleveland.

"The Application of Malleable Iron Castings in Car Construction," by Frank J. Lanahan, Port Pitt Malleable Iron Company, Pittsburgh.

Report of A. F. A. Committee on Standard Specifications for Malleable Iron Castings, by Enrique Touceda, chairman.

"Suggested Standards for Pattern Parts," by W. W. Carlson, Kansas State Agricultural College, Manhattan, Kan.

Heat-Treatment, Corrosion, etc., Non-Ferrous Metals:

"Deterioration of Muntz Metal," by H. S. Rawdon, United States Bureau of Standards, Washington, D. C.

"The Initial Stress Produced by the Burning-In of Manganese Bronze," by Paul D. Merica and C. P. Karr, United States Bureau of Standards.

"A Curious Case of Corrosion of Tinned Sheet Copper," by Paul D. Merica.

"Notes on the Occurrence and Significance of Twinned Crystals in Electrolytic Copper," by H. S. Rawdon.

"The Annealing Properties of Copper," by G. V. Caesar and G. C. Gerner, Hammond Laboratory, Yale University, New Haven, Conn.

"Some Uses and Properties of German Silver as Applied to the Optical Trade," by G. C. Holder, American Optical Company, Southbridge, Mass.

Gray Iron Session: *Friday, Sept.* 15.

"The Effects of Different Mixtures on the Strength of Chilled Car Wheels," by G. S. Evans, Lenoir Car Works, Lenoir City, Tenn.

"Semi-Steel Classified," by David McLain, McLain's System, Milwaukee.

Report of A. F. A. Committee on Standard Methods for Analyzing Coke, by H. E. Diller, chairman, General Electric Company, Erie, Pa.

"Use of By-product Coke in Foundries," by George A. T. Long, Pickands, Brown & Co., Chicago.

"The Use of Borings in Cupola Operations," by James A. Murphy, Hooven, Owens & Rentschler Company, Hamilton, Ohio.

"The Use of Cheaper Materials," by C. C. Kawin, Charles C. Kawin Company, Chicago.

"One-third of a Century in a Gray Iron Foundry," by Alfred E. Howell, Phillips & Buttorff Mfg. Company, Nashville, Tenn.

"Thermal Reactions in Gray Iron," by Thomas Turner, The University, Birmingham, England.

Report of A. F. A. Committee on General Specifications for Gray Iron Castings, by W. P. Putnam, chairman, Detroit Testing Laboratory, Detroit:

Steel Session:

"The Use of Titanium in the Manufacture of Steel Castings," by W. A. Janssen, Bettendorf Company, Davenport, Iowa.

"Acid Versus Basic Steel for Making Castings," by E. F. Cone, THE IRON AGE, New York.

"Alloy Steel Castings," by David Evans, Chicago Steel Foundry Company, Chicago.

"Theory and Practice in Gating and Heading Steel Castings," by Ralph D. West, West Steel Casting Company, Cleveland.

"The Small Open-Hearth as a Flexible Unit for Either Large Steel Foundries or General Jobbing Shops," by Frank Carter, Milwaukee, Wis.

Report of A. F. A. Committee on Specifications for Steel Castings, by John Howe Hall, chairman.

Physical Tests, Metallography, etc., Non-Ferrous Metals:

"Aluminum Castings and Forgings," by P. E. McKinney, United States Navy Yard, Washington, D. C.

"Copper-Aluminum-Iron Alloys," by W. M. Corse, Titanium Alloy Mfg. Company, Niagara Falls, N. Y.

"Physical Tests on Common High Brass Taken Parallel and at Right Angles to the Direction of Rolling," by William B. Price and Philip Davidson, Scovil Mfg. Company, Waterbury, Conn.

"Seasoning Cracks and the Self-Annealing of Brass," by W. Arthur, Frankford Arsenal, Frankford, Philadelphia.

"Co-operation with the Metal Industries in Metallographic Work," by C. H. Mathewson, director, Hammond Laboratory, Yale University, New Haven, Conn.

CONTENTS

Two Examples of Foundry Cost Accounting..... 493
An Electric Vibrator for Foundries..... 498
Oxygen for Opening Frozen Tap Holes..... 498
Engineering Service Plus Machine Building..... 499
Reclaiming Waste Molding Sand..... 505
New South Wales Steel and Iron Output..... 505
A Centrifugal Machine for Casting Pipe..... 506
Jobbing Foundry Installs 2-Ton Furnace..... 510
Plant for Making Electric Vacuum Cleaners..... 513
Youngstown Iron & Steel Company's Additions..... 516
The Grönwall-Dixon Electric Furnace..... 517
Powdered Coal Under Steam Boilers at Parsons, Kansas. 520
Foundrymen's Conventions at Cleveland..... 521
Production Methods in Gas Engine Plant..... 529
British Steel Exports..... 535
Exports of Grecian Magnesite..... 535
Building the New Navy a Serious Problem..... 536
Pollak Steel Company Adds South Chicago Plant..... 537
Willamette Works Adding Large Boiler Shop..... 537
Additions to Australia's New Steel Plant..... 537
National-Acme Company to Build New Plant..... 537
Triumphant Unionism..... 538
Unit vs. Blanket Bids on Castings..... 538
The Puddler's Earnings..... 539
The Trade Commission No Issue..... 539
Iron a Barometer..... 540
Correspondence..... 540
Central Western Iron-Ore Rates Readjusted..... 541
Hearing on Iron and Steel Export Rates..... 542
Papers to Be Read at Foundry Meetings..... 542
Japan's Boom in Metals..... 543
Little Change in Pig Iron..... 544
Blast Furnace Notes..... 545
Merchant Mill Record at Bethlehem..... 545
Germany's Steel Output for June..... 545
Transcontinental Freight Advances Postponed..... 545
Iron and Metal Markets..... 546
Iron and Industrial Stocks..... 556
Japan as a Source of Tungsten..... 556
Finished Iron and Steel Prices, Pittsburgh..... 557
German Pig-Iron and the Manganese Supply..... 558
Pittsburgh and Nearby Districts..... 559
Changes at American & British Mfg. Company..... 559
Increasing Its Tungsten and Alloy Plant..... 559
Personal..... 560
New Method of Producing Copper Coated Steel..... 560
Strikes and Settlements..... 561
Two Blast Furnaces for Ford Tractor Company..... 561
Obituary..... 561
Foundry Exhibition Opens Sept. 12..... 561
Machinery Markets and News of the Works..... 562
Book Reviews..... 568
Tractors Handle Pig Iron..... 569
Shipping a 75-Ton Flywheel..... 570
Electric Welding of Pulleys..... 570

Japan's Boom in Metals

The boom in Japan's metal industry in 1915 appears from the statement of the director of the Mining Bureau of the Department of Agriculture and Commerce that the total value of the mineral output in 1915 was $87,711,075, exclusive of the production of the Government iron works. This was a gain of $10,428,620 over 1914. The total value of metals produced amounted to $17,811,405, or 57 per cent above the previous year's figures. The increase in copper output was 7 per cent, and in value more than 37 per cent over 1914. Antimony output increased 200 per cent, while the gain in value was 8750 per cent. Zinc showed an advance of 206 per cent in output and 804 per cent in value.

LITTLE CHANGE IN PIG IRON

August Falls Below July in Output

A Gain of Four Furnaces, However, and September Rate Is Higher

Due to hot and humid weather, August pig-iron production fell slightly below that of July. The total as reported to THE IRON AGE was 3,203,713 tons, or 103,346 tons a day, against 3,224,513 tons in July, or 104,017 tons a day. There was a net gain of four active furnaces in the changes caused by the blowing in and blowing out of furnaces in August. The number on the active list Sept. 1 was 320, with a daily capacity of 104,502 tons, against 316 active furnaces on Aug. 1, with a daily capacity of 103,624 tons.

DAILY RATE OF PRODUCTION

The daily rate of production of coke and anthracite pig iron by months, from August, 1915, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons

	Steel Works	Merchant	Total
August, 1915	67,801	21,865	89,666
September	70,977	24,108	95,085
October	73,595	27,227	100,822
November	73,282	27,962	101,244
December	73,647	29,686	103,333
January, 1916	72,614	30,132	102,746
February	75,305	31,151	106,456
March	76,274	31,393	107,667
April	77,226	30,366	107,592
May	77,706	30,716	108,422
June	76,526	30,527	107,053
July	74,397	29,620	104,017
August	74,617	28,729	103,346

CAPACITY IN BLAST SEPTEMBER 1 AND AUGUST 1

The following table shows the daily capacity in gross tons of furnaces in blast September 1 and August 1 by districts:

Coke and Anthracite Furnaces in Blast

Location of furnaces	Total number of stacks	Sept. 1 Number in blast	Sept. 1 Capacity per day	Aug. 1 Number in blast	Aug. 1 Capacity per day
New York:					
Buffalo	19	16	5,395	16	5,355
Other New York	5	3	550	3	578
New Jersey	6	1	230	1	214
Pennsylvania:					
Lehigh Valley	20	13	3,720	12	3,494
Spiegel	2	2	206	2	202
Schuylkill Val.	12	10	2,855	10	2,897
Lower Susquehanna	6	5	1,370	5	1,376
Lebanon Valley	8	7	835	7	911
Ferro and Spiegel	1	1	90	0	0
Pittsburgh Dist.	53	49	22,825	50	23,274
Ferro	3	3	405	3	306
Shenango Val.	19	19	5,944	18	5,771
Western Pa.	24	20	5,841	18	5,377
Ferro and Spiegel	3	1	100	1	108
Maryland	3	3	1,230	3	1,238
Ferro	1	1	92	1	104
Wheeling Dist.	14	13	3,981	13	4,133
Ohio:					
Mahoning Val.	25	24	10,445	25	10,613
Central and Northern	24	22	8,551	21	8,425
Hock. Val., and Hang'g Rock.	15	11	1,550	11	1,608
Ill. and Ind.	35	31	14,812	30	14,666
Ferro	2	1	60	2	150
Michigan, Wis. & Minn.	12	9	2,378	9	2,303
Col. and Mo.	6	4	1,273	3	1,032
Ferro	1	1	126	1	169
The South:					
Virginia	18	9	1,133	9	1,070
Kentucky	5	3	450	4	498
Alabama	38	29	7,085	28	6,721
Tennessee	15	9	970	10	1,081
Total	394	320	104,502	316	103,674

Among furnaces blown in between Aug. 1 and Sept. 1 was one Bethlehem in the Lehigh Valley, Meily in the Lebanon Valley, Ella in the Shenango Valley, one Cambria at Johnstown and one Saxton in western Pennsylvania, Oriskany in Virginia, one Central at Cleveland, one Wellston in the Hanging Rock district, Mississippi Valley in Missouri and one Gadsden and Woodstock in Alabama.

Among furnaces blown out last month were one Isabella in the Pittsburgh district, Marshall in western Pennsylvania, Covington in Virginia, one Ashland in Kentucky, Cherry Valley in Mahoning Valley, Hamilton in Hanging Rock district, one Clifton in Alabama and Standard in Tennessee.

OUTPUT BY DISTRICTS

The accompanying table gives the production of all coke and anthracite furnaces in August and the three months preceding:

Monthly Pig-Iron Production—Gross Tons

	May (31 days)	June (30 days)	July (31 days)	Aug. (31 days)
New York	210,464	190,140	190,319	182,812
New Jersey	6,686	6,379	6,621	7,020
Lehigh Valley	117,870	111,689	104,835	99,650
Schuylkill Valley	94,254	93,552	89,811	88,373
Lower Susquehanna and Lebanon Valley	80,293	75,092	73,440	69,558
Pittsburgh district	750,903	728,071	736,477	721,917
Shenango Valley	195,867	172,259	178,903	179,970
Western Pennsylvania	167,913	157,909	169,979	172,970
Maryland, Virginia and Kentucky	94,302	85,687	87,294	92,540
Wheeling district	131,764	125,889	128,135	123,426
Mahoning Valley	324,739	315,675	314,461	326,413
Central and Northern Ohio	274,693	274,526	261,162	263,587
Hocking Valley and Hanging Rock	46,079	48,640	48,624	50,168
Chicago district	481,714	462,394	465,895	460,836
Mich., Minn., Mo., Wis. and Col.	127,278	123,116	121,285	115,341
Alabama	223,439	204,076	213,973	219,076
Tennessee	32,815	33,494	33,299	30,056
Total	3,361,073	3,211,588	3,224,513	3,203,713

PRODUCTION OF STEEL COMPANIES

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of steel-making iron month by month, together with ferromanganese and spiegeleisen. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons

	Pig, total production 1914	1915	1916	Spiegeleisen and ferromanganese 1914	1915	1916
Jan.	1,261,430	1,115,944	2,251,035	17,325	18,041	24,866
Feb.	1,329,414	1,237,380	2,183,845	10,524	13,319	23,877
Mar.	1,704,688	1,551,082	2,365,116	20,133	12,274	29,388
Apr.	1,635,226	1,584,111	2,316,768	18,676	12,337	31,862
May	1,457,847	1,694,290	2,408,890	21,504	13,440	35,844
June	1,329,623	1,770,657	2,295,784	16,254	19,200	38,597
July	1,395,851	1,949,750	2,306,303	16,524	17,854	31,353
Aug.	1,455,054	2,101,818	2,313,122	11,577	27,463	33,338
Sept.	1,390,322	2,129,322	.....	13,786	23,159	.....
Oct.	1,271,820	2,281,456	.....	17,435	23,992	.....
Nov.	1,059,159	2,198,459	.....	21,977	28,741	.....
Dec.	1,034,802	2,283,047	.....	20,733	25,004	.....

THE RECORD OF PRODUCTION

Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1912—Gross Tons

	1912	1913	1914	1915	1916
Jan.	2,057,911	2,795,331	1,885,054	1,601,421	3,185,121
Feb.	2,100,815	2,586,337	1,888,670	1,674,771	3,087,212
Mar.	2,405,318	2,763,563	2,347,867	2,063,334	3,337,691
Apr.	2,375,436	2,752,761	2,269,655	2,116,494	3,227,768
May	2,512,582	2,822,217	2,092,686	2,263,470	3,361,073
June	2,440,745	2,628,565	1,917,783	2,380,827	3,211,588
July	2,410,889	2,560,646	1,957,645	2,563,420	3,224,513
Aug.	2,512,431	2,545,763	1,995,261	2,779,647	3,203,713
8 mo.	18,816,127	21,455,183	16,354,621	17,443,884	25,838,679
Sept.	2,463,839	2,505,927	1,882,577	2,852,561	.....
Oct.	2,689,933	2,546,261	1,778,186	3,125,491	.....
Nov.	2,630,854	2,233,123	1,518,316	3,037,308	.....
Dec.	2,782,737	1,983,607	1,515,752	3,203,322	.....
Total, yr.	29,383,490	30,724,101	23,049,752	29,662,566	.....

DIAGRAM OF PIG-IRON PRODUCTION AND PRICES

The figures for daily average production, beginning January, 1909, are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1909—Gross Tons

	1909	1910	1911	1912	1913	1914	1915	1916
Jan.	57,975	84,148	56,752	66,384	90,172	60,808	51,659	102,746
Feb.	60,976	85,616	64,090	72,442	92,369	67,453	59,813	106,456
Mar.	59,232	84,459	70,036	77,591	89,147	75,738	66,575	107,667
Apr.	57,962	82,792	68,836	79,181	91,759	75,665	70,550	107,592
May	60,753	77,102	61,079	81,051	91,039	67,506	73,015	108,422
June	64,656	75,516	59,585	81,358	87,619	63,916	79,361	107,053
July	67,793	69,305	57,841	77,738	82,601	63,150	82,691	103,624
Aug.	72,546	67,963	62,150	81,046	82,057	64,363	89,666	104,502
Sept.	79,507	68,476	65,903	82,128	83,531	62,753	95,085	.....
Oct.	83,856	67,520	67,811	86,722	82,133	57,361	100,822	.....
Nov.	84,917	63,659	66,648	87,697	74,453	50,611	101,244	.....
Dec.	85,022	57,349	65,912	89,766	63,987	48,896	103,333	.....

The fluctuations in pig-iron production from January, 1908, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of THE IRON AGE.

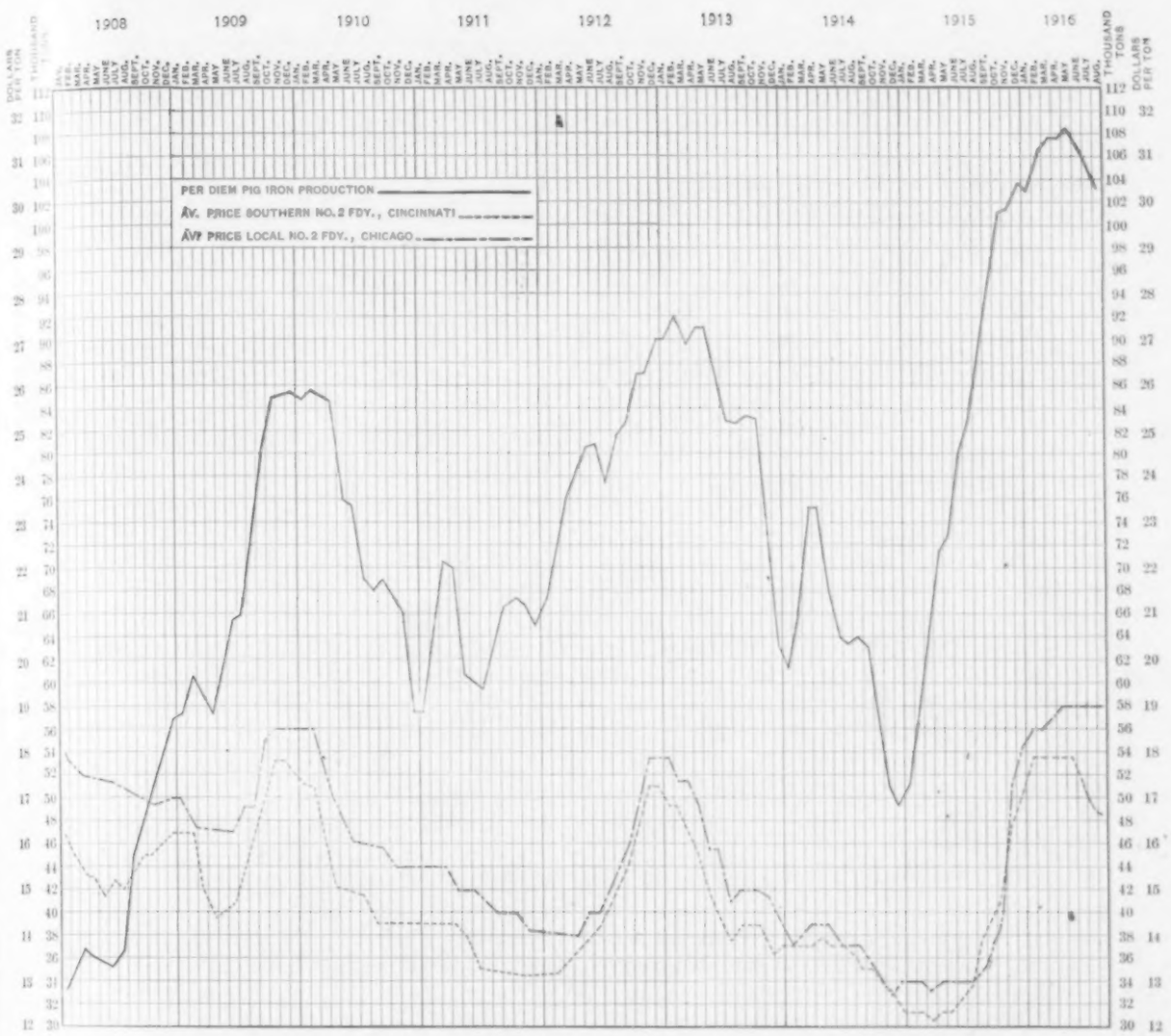


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from Jan. 1, 1908, to Sept. 1, 1916; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

Blast Furnace Notes

The Alabama Company blew in its No. 1 furnace at Gadsden, Ala., Aug. 31, for the production of Etowah pig iron. Only one of the company's furnaces at Ironaton is now in operation, the No. 2 furnace there having been blown out.

B furnace of the Detroit Iron & Steel Company at Zug Island, Detroit, is now ready to go in blast.

It is expected that the blast furnace at Big Stone Gap, Va., will be blown in at the beginning of the new year.

D furnace of the Bethlehem Steel Company's Lehigh plant, South Bethlehem, Pa., was blown in Aug. 31, having been out since July 29 for relining.

No. 7 Franklin blast furnace of the Cambria Steel Company, Johnstown, Pa., has been started up after being relined. In addition the shell was remodeled.

The No. 1 Bird Coleman furnace of the Lackawanna Iron & Steel Company at Cornwall, Pa., is being relined.

Merchant Mill Record at Bethlehem

The 22-in. mill of the new merchant mill layout of the Bethlehem Steel Company, South Bethlehem, Pa., broke its record with an output of 9189 tons in August, as compared with 8168 tons, the previous high figure, reached in May of this year.

The Iron Products Company, Philadelphia, has taken over the Slatington Rolling Mill at Slatington, Pa., and proposes to put it in operation at once in the manufacture of merchant bar iron. A dispatch from Allentown states that the capacity of the plant will be doubled.

Germany's Steel Output for June

Germany's steel output for June is reported as 1,319,762 metric tons, against 1,412,137 tons in May, the record war month. Counting 24 German working days in June, the daily output was 54,990 tons, the largest since the war started, the previous record having been 52,301 tons per day in May. The June total was made up of 659,347 tons of Bessemer steel, 539,647 tons of open-hearth steel, 96,784 tons of steel castings, 8947 tons of crucible steel, and 15,037 tons of electric steel. The steel-casting and electric steel output are unusually large.

To July 1, 1916, the steel output was 7,746,000 tons, against 6,187,000 tons to July 1, 1915, or an increase of about 25 per cent. In the same period this year the pig-iron output was 6,497,000 tons, so that steel production now exceeds that of pig iron.

Transcontinental Freight Advances Postponed

The Interstate Commerce Commission has suspended from Sept. 1 until Dec. 30, 1916, the operation of certain tariffs which contain proposed increased transcontinental commodity rates to and from Pacific coast points. These schedules were the subject of an informal hearing before the Board of Suspension at Washington, Aug. 14 to 19 inclusive, on application by shippers from various parts of the country for suspension thereof. The advanced rates would have borne especially heavy on shipments of pig iron, cast-iron pipe and coke from Alabama.

The Greenfield Tap & Die Corporation, Greenfield, Mass., has discontinued its store in Detroit.

Iron and Steel Markets

STEEL EXPORTS FALL OFF

July Below May and June Records

Allies Buying Shell Steel Discards—Iron-Ore Movement at High Point

That pig-iron output in August fell below that of July indicates the handicaps under which the industry is trying to meet the present unparalleled demands upon it. Last month's total was 3,203,713 tons, or 103,346 tons a day, against 3,224,513 tons in July, or 104,017 tons a day. Heat and humidity counteracted the effect of a slight increase in active furnaces. September should show some gain, as 320 furnaces were in blast at the opening of the month, with a daily capacity of 104,502 tons, as against 316 furnaces on Aug. 1, representing a capacity of 103,624 tons a day.

The height of the buying movement in pig iron so far as concerns the Central West seems to have been passed last week. Following the marked activity in basic iron, foundries came into the market and a good many 3000 to 6000-ton sales were made. Perhaps 50,000 tons was taken up by such buyers. At Chicago the buying of foundry iron for the first half has been relatively less than in other districts.

Southern iron, which has long been weaker than Northern grades, is at last putting on a better front. While $14 for No. 2 is still possible on two or three brands, $14.50, Birmingham, is more commonly the price for this year's delivery, while for next year $14.50 to $15 has been the range of recent contracts.

On both export and domestic account buying of steel keeps up on a scale showing that hopes of lower prices have been put aside indefinitely. For the Allies the taking up of large lots of shell steel discards further accents the scarcity of the forms of steel for which they have been scouring the market lately. Two Central Western steel companies have disposed of about 100,000 tons of such material and the supply is now about cleaned up.

The July exports of iron and steel reported in tons were 496,000 tons, against 527,000 tons in June and 540,000 tons at the highest rate, which was in May. It is not to be concluded from these figures that the high point has been reached in the war boom, but the export movement will be closely watched for signs of the turn. Steel works order books do not show it.

The placing with a Western maker of 4000 small gondola-type cars is the only tangible outcome thus far of the long negotiations for rolling stock for Russia. Many more cars are needed, but the deal has taken a devious road.

Further sales of ship steel have been made to Japan, including 10,000 tons of plates. Canada is buying steadily in this market, the week's orders including 7000 tons of structural steel placed at Chicago.

The railroads find a surprisingly small amount of steel in some of their lines available for the first half of next year. Belated inquiries have come out in Chicago, showing that spikes, bolts and angle bars from usual sources will not be available before the last quarter of 1917 and that tie plates are sold up to the second quarter of next year.

Bar contracts for the first half of next year are rapidly taking up the remaining capacity and users of high carbon bars have been actively covering their needs.

Another record in iron-ore shipments from Lake Superior was made in August at 9,850,000 tons. The total to Sept. 1 was 39,215,000 tons. Allowing that the grain movement will reduce ore shipments in September and October below the season's average thus far, and reckoning only 5,000,000 tons for November, there is still a prospect that the total will exceed 62,000,000 tons.

The Interstate Commerce Commission's decision on iron-ore rates from Lake Erie ports to furnaces in the Central West wipes out the long-standing equalizing scheme of the railroads in a way little expected by the complaining furnace companies. The net result is no reduction for most of them and for many an actual increase. Such a wrenching of the competitive line-up will not be serious while the boom lasts, but since it will bring on the overhauling of iron and steel freight rates in all districts its ultimate possibilities are highly disturbing.

Pittsburgh

PITTSBURGH, PA., Sept. 5, 1916.

Reports are that the Allies have been heavy buyers of shell steel discards recently, and that the local supply has been pretty well cleaned up. One Youngstown interest is said to have sold 50,000 to 60,000 tons of discards for export, and another interest nearly as large an amount. This will emphasize the shortage in supply of soft Bessemer and open-hearth steel, as a good many users that were buying shell steel discards will now have to buy regular soft Bessemer and open-hearth steel. As an offset to this, many of the steel casting makers are now casting ingots and selling them to the steel plants, the amount of such steel available being very considerable. The general market is without particular change, sellers stating there is no trouble in selling anything at good prices if they can make the deliveries. The market on Bessemer and basic pig iron is strong, some sellers absolutely refusing to shade $18.50, Valley furnace, on basic iron. There is a good deal of inquiry for foundry iron for first half of next year. Steel billets and sheet bars are still scarce, bring-

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

Pig Iron, Per Gross Ton:	Sept. 6, 1916.	Aug. 30, 1916.	Aug. 9, 1916.	Sept. 8, 1915.
No. 2 X, Philadelphia...	$19.50	$19.50	$19.50	$16.00
No. 2, Valley furnace....	18.25	18.25	18.25	14.50
No. 2 Southern, Cin'ti...	16.90	16.90	16.90	13.90
No. 2, Birmingham, Ala..	14.00	14.00	14.00	11.00
No. 2, furnace, Chicago*	**18.50**	18.00	18.50	13.50
Basic, del'd, eastern Pa..	19.75	19.75	19.00	17.00
Basic, Valley furnace....	18.00	18.00	18.00	14.50
Bessemer, Pittsburgh ...	21.95	21.95	21.95	16.95
Malleable Bess., Ch'go..*	19.00	19.00	19.00	13.50
Gray forge, Pittsburgh..	18.70	18.70	18.70	14.70
L. S. charcoal, Chicago..	19.75	19.75	19.75	15.75
Billets, etc., Per Gross Ton:				
Bess. billets, Pittsburgh..	45.00	45.00	43.00	24.00
O.-h. billets, Pittsburgh..	45.00	45.00	45.00	24.50
O.-h. sheet bars, P'gh....	45.00	45.00	45.00	25.00
Forging billets, base, P'gh	69.00	69.00	69.00	32.00
O.-h. billets, Phila.....	48.00	48.00	45.00	32.00
Wire rods, Pittsburgh....	55.00	55.00	55.00	29.00
Finished Iron and Steel, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.47½	1.47½	1.47½	1.25
O.-h. rails, heavy, at mill	1.56½	1.56½	1.56½	1.34
Iron bars, Philadelphia..	2.659	2.659	2.659	1.459
Iron bars, Pittsburgh....	2.60	2.60	2.60	1.35
Iron bars, Chicago.....	2.35	2.35	2.35	1.25
Steel bars, Pittsburgh....	2.60	2.60	2.50	1.35
Steel bars, New York....	2.769	2.769	2.669	1.519
Tank plates, Pittsburgh..	4.00	4.00	3.50	1.35
Tank plates, New York..	4.169	4.169	3.669	1.519
Beams, etc., Pittsburgh..	2.60	2.60	2.50	1.35
Beams, etc., New York..	2.769	2.769	2.669	1.519
Skelp, grooved steel, P'gh	2.35	2.35	2.35	1.30
Skelp, sheared steel, P'gh	2.45	2.45	2.45	1.35
Steel hoops, Pittsburgh..	3.00	3.00	2.75	1.35

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire, Per Lb. to Large Buyers:	Sept. 6, 1916. Cents.	Aug. 30, 1916. Cents.	Aug. 9, 1916. Cents.	Sept. 8, 1915. Cents.
Sheets, black, No. 28, P'gh	2.90	2.90	2.90	1.90
Galv. sheets, No. 28, P'gh	4.15	4.15	4.25	3.60
Wire nails, Pittsburgh..	2.60	2.60	2.60	1.65
Cut nails, Pittsburgh....	2.60	2.60	2.60	1.60
Fence wire, base, P'gh..	2.55	2.55	2.55	1.50
Barb wire, galv., P'gh...	3.45	3.45	3.45	2.50
Old Material, Per Gross Ton:				
Iron rails, Chicago.....	18.75	18.75	18.50	13.50
Iron rails, Philadelphia..	20.00	20.00	20.00	18.50
Carwheels, Chicago.....	11.50	11.50	11.50	11.75
Carwheels, Philadelphia..	15.50	15.50	15.50	14.00
Heavy steel scrap, P'gh..	16.00	16.00	16.00	14.50
Heavy steel scrap, Phila..	14.75	14.75	14.75	15.00
Heavy steel scrap, Ch'go	**15.75**	15.25	15.25	11.75
No. 1 cast, Pittsburgh...	14.50	14.50	15.00	13.00
No. 1 cast, Philadelphia..	16.00	16.00	16.00	14.00
No. 1 cast, Ch'go (net ton)	**12.00**	11.50	11.50	10.00
No. 1 RR. wrot, Phila...	20.00	20.00	19.50	16.50
No. 1 RR. wrot, Ch'go (net ton)	**16.00**	15.50	15.25	11.00
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt...	**$3.00**	$2.90	$2.75	$1.50
Furnace coke, future....	2.50	2.50	2.50	1.75
Foundry coke, prompt...	3.50	3.50	3.25	2.00
Foundry coke, future....	3.50	3.50	3.50	2.25
Metals, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York..	**28.00**	27.50	26.75	18.00
Electrolytic copper, N. Y.	**28.00**	27.25	26.50	17.50
Spelter, St. Louis.....	*8.50*	8.75	8.12½	14.25
Spelter, New York.....	*8.75*	9.00	8.37½	14.50
Lead, St. Louis.....	**6.60**	6.50	5.75	4.75
Lead, New York.....	**6.75**	6.50	5.95	4.90
Tin, New York.....	*38.87½*	39.25	37.67½	33.25
Antimony, Asiatic, N. Y..	*12.00*	13.50	11.00	28.00
Tin plate, 100-lb. box, P'gh	$5.75	$5.75	$6.00	$3.15

ing up to $45 and higher in some cases. Specifications against contracts for all kinds of finished material are active, with steel mills and smaller manufacturing plants well sold up for the remainder of the year. Wire products are in sharp demand, with a decided scarcity in barb wire. Furnace coke is not plentiful and has sold for spot shipment at $3 and probably higher for best grades. Scrap is dull and neglected.

Pig Iron.—W. P. Snyder & Co. report the average price on Bessemer iron for August to have been $21 and on basic $18, both at Valley furnace, being the same averages as for July. There is some export inquiry for Bessemer iron, one calling for 4000 tons for last three months of this year and another of 10,000 tons for Italy for delivery over four or five months. The latter inquiry is likely to result in a sale, as the New York party that makes the inquiry claims to have a boat ready for 2000 to 3000 tons if shipment can be made within a week. The Harrisburg Pipe & Pipe Bending Company, Harrisburg, Pa., is in the market for 18,000 tons of basic iron, 3000 tons a month over first six months of 1917, and the Kennedy-Stroh Corporation for 2500 tons for this year. The Westinghouse Electric & Mfg. Company is inquiring for 15,000 to 20,000 tons or more of foundry iron for its Cleveland plant for delivery in first and second quarters of 1917. Bessemer iron is not so strong, one or two small sales being reported at slightly under $21; but basic is firm at $18, with the supply limited. Some sellers of basic refuse to consider less than $18.50, and believe the market will be $19 or higher before the end of this year. About a month ago a leading interest bought around 25,000 tons of basic for delivery in first half of 1917 at less than $18 at Valley furnace, and this unsettled the market to some extent. Foundry iron is firm at $18.25 to $18.50 at Valley furnace. We note two sales of 500 tons each of malleable Bessemer iron at $18.50, one sale of 1500 tons of standard Bessemer iron at $21, 500 tons of basic at $18, 200 tons of No. 2 foundry at $18.25, and other sales of foundry aggregating 1200 to 1500 tons, part of it into next year, at $18.50, all at Valley furnace. We quote Bessemer iron at $21; basic, $18 to $18.50; gray forge, $17.75 to $18; malleable Bessemer, $18.50, and No. 2 foundry, $18.25 to $18.50, all at Valley furnace, the freight to the Pittsburgh and Cleveland districts being 95c. per ton.

Ferroalloys.—Inquiry for ferromanganese for early delivery is better, two concerns asking for 700 to 800 tons, and prices are firmer. The market on English 80 per cent ferromanganese is $175, seaboard, but for some time domestic makers have been shading this price $5 to $10 per ton or more and taking all the business. Domestic 80 per cent ferromanganese is held today about $170, seaboard, freight added to destination. We quote 18 to 22 per cent spiegeleisen at $40 to $45, and 25 to 30 per cent, $55 to $65, at furnace. On 50 per cent ferrosilicon we quote $88 to $89 in lots up to 100 tons; over 100 tons, $87 to $88, and over 600 tons, $86 to $87, all per gross ton, f.o.b. Pittsburgh. We quote Bessemer ferrosilicon as follows: 9 per cent, $30; 10 per cent, $31; 11 per cent, $32; 12 per cent, $33; 13 per cent, $34.50; 14 per cent, $36.50; 15 per cent, $38.50, and 16 per cent, $41. Seven per cent silvery is $28.50; 8 per cent, $29; 9 per cent, $29.50; 10 per cent, $30; 11 per cent, $31, and 12 per cent, $32. These prices are f.o.b. furnace, Jackson or New Straitsville, Ohio, or Ashland, Ky., all having a freight rate of $2 per gross ton to Pittsburgh.

Billets and Sheet Bars.—The fact that large quantities of shell steel discards have lately been sold for export is expected to emphasize the shortage in supply of soft Bessemer and open-hearth steel. However, the opinion still prevails that before long the shortage will have been corrected to some extent, owing to the large amount of new capacity in open-hearth steel that will be active. It is almost impossible to quote accurately the ruling prices on soft Bessemer and open-hearth steel, as they vary a great deal, depending on the needs of the buyer and the quantity and kinds of steel he wants. Dealers are picking up a good deal of open-hearth steel from steel-casting plants, and are offering it in the form of small ingots at $43 to $45. When a mill quotes on an inquiry for billets or sheet bars the price is usually $45 or higher. We note a sale of 200 tons of forging billets for November and December delivery at a price slightly better than $70, delivered Pittsburgh. This order was put up to practically every maker of forging billets, and the fact that the buyer

paid this high price indicates clearly the strength of the market on forging billets. We quote soft Bessemer and open-hearth billets and sheet bars at $45, maker's mill, Pittsburgh or Youngstown. From dealers it might be possible to obtain steel at $1 to $2 per ton less for ordinary specifications and carbons. We quote forging billets at $69 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take $1 extra.

Structural Material.—The new inquiry has been more active and some good jobs have been placed. The McClintic-Marshall Company has taken 1700 tons for an East River tunnel, New York, and 500 tons for additions to the plant of the Donner Steel Company. The Fort Pitt Bridge Works has secured about 2000 tons for extensions to open-hearth buildings and a crane runway for the Youngstown Iron & Steel Company. Bids have gone in on 6000 tons or more for the new shops of the Westinghouse Machine Company at Essington, near Philadelphia, also on the Southern Hotel at Baltimore, about 1000 tons, and for the new Arlington Hotel in Washington, D. C., about 5000 tons. Bids closed Sept. 2 on about 6000 tons for new structural shops for the Norfolk Navy Yard. A local mill is reported to have taken 10,000 tons of plain material for export shipment in the first four months of 1917. We quote beams and channels up to 15 in. at 2.60c. at mill for such deliveries as the mill can make, while small lots from stock for prompt shipment bring 3c. to 3.25c., Pittsburgh.

Steel Rails.—Export inquiry for standard sections is reported heavy, but domestic roads are placing few new orders. The Carnegie Steel Company could not take on any more work in standard sections for delivery prior to July of next year. The new demand for light rails is active, but much of the business is going to the rerolling rail mills. We quote 25 to 45 lb. sections at $47; 16 and 20 lb., $48; 12 and 14 lb., $49; and 8 and 10 lb., $50, in carload lots, f.o.b. at mill, the usual extras being charged for less than carload lots. We quote standard section rails of Bessemer stock at 1.47½c., and of open hearth 1.56½c., Pittsburgh.

Plates.—As indicating the strength in prices on plates, it is said a large consumer recently offered to contract for 5000 tons per month over the first six months of 1917 at about 4c. per pound if he were guaranteed deliveries, but the offer was refused by two mills. Plates, ¼ in. and heavier, for shipment in 30 to 60 days, readily bring 4c. to 4.25c. at mill. The two leading local mills are still quoting 3c., but for very extended delivery, probably in second quarter of next year. Car orders are scarce and no large inquiries are out. The minimum mill price on sheared plates is 3c. for delivery in first quarter and first half of 1917. We quote ¼-in. and heavier plates for shipment in two to four months, from 4c. to 4.50c., Pittsburgh.

Sheets.—A feature of the market is the heavy export demand, particularly for galvanized sheets. One interest has booked lately good orders of Bessemer black and galvanized for shipment to England, Russia and France, for which it obtained higher than ruling domestic prices on galvanized. A Cleveland interest has recently taken 10,000 tons of light plates and blue annealed sheets for delivery over the remainder of the year. On an inquiry recently for a round lot of sheets for roofing purposes, the prices quoted were from 2.90c. up to 3.15c. Prices on Bessemer black sheets are stronger than for some time. Specifications are heavy. The American Sheet & Tin Plate Company is operating this week to 94 per cent of hot sheet mill capacity. The cooler weather of the last two weeks has increased the output of sheets to some extent. We quote Nos. 9 and 10 blue annealed sheets at 2.90c. to 3.15c., for delivery at convenience of the mill. No. 28 Bessemer and open-hearth black sheets, 2.90c. to 3c.; No. 28 galvanized, Bessemer, and open-hearth, 4.15c. to 4.25c.; Nos. 22 and 24 black plate, tin-mill sizes, H. R. & A., 2.90c.; Nos. 25, 26 and 27, 3c. to 3.10c.; No. 28, 3.10c. to 3.15c., and No. 29, 3.20c. to 3.25c. These prices are for carloads and larger lots, f.o.b. mill, Pittsburgh.

Tin Plate.—Some consumers are importuning the mills to take their orders for delivery next year, the price to be fixed later, but only in a few cases has this been done. One mill has taken an order for 80,000 boxes for Pacific coast delivery in first quarter of 1917 at whatever price may be fixed for first half. The opinion is that tin plate for first half of 1917 will be about $5.50 per base box, but nothing definite has been done. Export inquiry is heavy, one calling for 70,000 boxes and another for 25,000 boxes. Current demand for this year is fair, mills stating they are getting $5.50 to $5.75 for plate from stock. The American Sheet & Tin Plate Company operated last week to about 97 per cent of hot tin mill capacity. To regular customers mills are quoting tin plate from stock at $5.50, while production tin plate is quoted at $5.75 and up to $6 to the domestic trade. For export, $6 to $6.25 per base box is quoted. We quote 8-lb. coated ternes at $8.50 to $8.75 for 200 lb., and $8.75 to $9 for 214 lb., all f.o.b. Pittsburgh.

Cold-Rolled Strip Steel.—It is likely that within a short time several makers will open their books on contracts for delivery in first half of 1917. Most consumers are covered for the remainder of this year, but one contract was placed last week for 300 tons at $6, base, per 100 lb. We quote cold-rolled strip steel at $6 base on contracts for delivery over the remainder of the year, and $6.50 to $6.75 in small lots for fairly prompt shipment. Terms are 30 days net, less 2 per cent off for cash in 10 days, delivered in quantities of 300 lb. or more when specified for at one time.

Wire Rods.—The demand is active and the supply very limited. As recently stated, prices being charged for rods depend largely on the kind of products they are going into. Some large consumers have covered for rods for some time ahead at $50, these rods going into wire and wire nails, while on other products, such as wire rope and high-grade wires, $55 and $60 have been paid. We note a sale of a fairly large lot of open-hearth rods for delivery over the last quarter at $55, maker's mill. We quote soft Bessemer, open-hearth and chain rods at $55 to $60 per ton, f.o.b. Pittsburgh, but to regular customers who buy in large quantities $50 per ton is being named.

Nuts and Bolts.—The new demand is fairly urgent, but most consumers are covered over the remainder of the year. Export inquiry is fairly active. Specifications are heavy. Deliveries of steel by the mills are still unsatisfactory, interfering materially with output. Most makers of nuts and bolts are sold up for three or four months. The discounts are as follows, delivered in lots of 300 lb. or more, where the actual freight rate does not exceed 20c. per 100 lb., terms 30 days net, or 1 per cent for cash in 10 days:

Carriage bolts, small, rolled thread, 50 and 5 per cent; small, cut thread, 40, 10 and 5 per cent; large, 35 and 5 per cent.

Machine bolts, h. p. nuts, small, rolled thread, 50 and 10 per cent; small, cut thread, 50 per cent; large, 40 and 5 per cent.

Machine bolts, c. p. c. and t. nuts, small, 40 and 10 per cent; large, 35 per cent. Blank bolts, 40 and 5 per cent. Bolt ends, h. p. nuts, 40 and 5 per cent; with c. p. nuts, 35 per cent. Rough stud bolts, 15 per cent. Lag screws (cone or gimlet point), 50 and 5 per cent.

Forged set screws and tap bolts, 10 per cent. Cup and round point set screws, case-hardened, 60 per cent. Square or hexagon head cap screws, 55 per cent. Flat, button, round or fillister head cap screws, 30 per cent.

Nuts, h. p. sq., tapped or blank, $2.70 off list; hex., $2.70 off. Nuts, c. p. c. and t. sq., tapped or blank, $2.40 off; hex., $2.80 off. Semi-finished hex. nuts, 60 and 5 per cent. Finished and case-hardened nuts, 60 and 5 per cent.

Rivets, 7/16 in. in diameter and smaller, 45, 10 and 5 per cent.

Rivets.—Makers report the new demand not so active as some time ago, but this is largely because consumers are covered over the remainder of the year. Export demand is heavy, coming from India, Russia and South America. Prices, which are being shaded to some extent by jobbers, are as follows: Buttonhead structural rivets, ½ in. in diameter and larger, $4 per 100 lb., base, and conehead boiler rivets, same sizes, $4.10 per 100 lb., base, f.o.b. Pittsburgh. Terms are

30 days net, or one-half of 1 per cent for cash in 10 days.

Railroad Spikes.—One local maker received specifications last week for upward of 20,000 kegs, the heaviest in any week for some months. New demand is dull. Not enough new business has been placed in spikes for some months to test prices, which are nominally as follows:

Standard railroad spikes, 4½ x 9/16 in. and larger, $2.65 to $2.75; railroad spikes, ½ and 7/16 in., $2.75 base; railroad spikes, ⅜ in. and 5/16 in., $3.05 base; boat spikes, $2.80 base, all per 100 lb., f.o.b. Pittsburgh.

Wire Products.—It is estimated that the consumption of fence wire in the United States runs about 450,000 tons per year, but this year the demand will be for less than half that amount. However, makers of fence wire are not urgently seeking orders, one large interest having some time ago withdrawn its salesmen, as it is pushing other products. The export demand for wire and wire nails is heavy, one inquiry coming in last week from South America for 2500 kegs of wire nails, half to be round and half to be square nails. Mills report that low-priced contracts are pretty well cleaned up and that shipments going out now on wire nails are largely on the $2.50 basis. On current orders $2.60 is being firmly held. Prices to the large trade, effective from Aug. 7, are as follows: Wire nails, $2.60, base, per keg; galvanized, 1 in. and longer, including large head barbed roofing nails, taking an advance over this price of $2, and shorter than 1 in., $2.50. Bright basic wire is $2.65 per 100 lb.; annealed fence wire, 6 to 9, $2.55; galvanized wire, $3.25; galvanized barb wire and fence staples, $3.45; painted barb wire, $2.75; polished fence staples, $2.75; cement-coated nails, $2.50, base, these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days net, less 2 per cent off for cash in 10 days. Discounts on woven wire fencing remain at 61½ per cent off list for carload lots, 60½ per cent for 1000-rod lots and 59½ per cent for small lots, f.o.b. Pittsburgh.

Iron and Steel Bars.—Most consumers are covered over the remainder of this year at lower prices than are ruling now, and in many cases deliveries on these contracts will run into the first quarter of 1917. Inquiries for steel rounds for shrapnel are heavy, but not much of this kind of business is being taken by local mills. The two leading steel-bar makers are sold up for the remainder of this year and probably 75 per cent of their output for the first half of 1917. Some remarkable records for output have recently been made in the Duquesne steel-bar mills of the Carnegie Steel Company. The new demand for iron bars is fairly active, local mills stating they are sold up for three to four months or longer. We quote merchant steel bars at 2.60c. at mill for delivery at convenience of the mill, which would be in last quarter of this year or first quarter of 1917, while for prompt shipment from warehouse 3c. to 3.10c. is quoted. We quote refined iron bars at 2.60c. to 2.70c., and railroad test bars, 2.70c. to 2.80c., f.o.b. Pittsburgh.

Shafting.—Some of the larger consumers have covered their shafting needs over the first half of 1917 at 20 per cent off list. Makers report specifications coming in freely. Prices are firm. On small current orders 15 per cent to 10 per cent off is being quoted for the remainder of this year delivery. We quote cold-rolled shafting at 20 to 15 per cent off in carload lots for delivery in last quarter of this year and first quarter of 1917, and 10 per cent off in less than carload lots, f.o.b. Pittsburgh, freight added to point of delivery.

Merchant Steel.—Inquiry is heavy from large consumers for delivery over the first half of next year, and some business has been closed at prices reported considerably higher than are ruling now. The new demand is heavy and specifications are coming in freely. August shipments of a leading maker showed an increase of nearly 25 per cent over July. We quote: Iron finished tire, ½ x 1½ in. and larger, 2.60c., base; under ½ x 1½ in., 2.75c.; planished tire, 2.75c.; smooth channel tire, ¾ to ⅞ and 1 in., 2.85c. to 2.90c.; 1⅛ in. and larger, 3.10c.; toe calk, 3.10c. to 3.15c., base; flat sleigh shoe, 2.75c.; concave and convex, 2.85c.; cutter shoes tapered or bent, 3.25c. to 3.35c.; spring steel, 3.25c. to 3.50c.; machinery steel, smooth finished, 2.90c. to 3c., all f.o.b. at mill.

Hoops and Bands.—There is not much new buying of either hoops or bands, as consumers are covered over the remainder of the year, and in some cases through the first quarter of 1917. Specifications are active. Both hoops and bands for prompt shipment bring premiums. For current orders hoops are 3c. and steel bands 2.60c. at mill, with extras on the latter as per the steel bar card. For fairly prompt shipment steel bands are quoted at 2.75c. and higher.

Wrought Pipe.—It is understood that the recent inquiry of the Sinclair Oil & Refining Company for about 800 miles of 10 to 12 in. pipe has been withdrawn, as none of the mills cared to bid on it. Actual orders entered for butt and lap weld pipe in August are reported to have been heavier than in July. The leading producer is said to be sold up for four or five months on lap-weld pipe, but on butt-weld sizes, up to 3 in., can make fairly prompt deliveries. The new demand for oil country goods is quiet, but it is said there have been no important cancellations of contracts, deliveries on these having been deferred until conditions in the oil trade improve. Discounts on both iron and steel pipe, printed on another page, are firmly held.

Boiler Tubes.—Consumers are covered and mills are sold up for four or five months on locomotive and merchant tubes and on seamless tubing for 12 to 15 months. Discounts on iron and steel tubes, given on another page, are strongly maintained.

Coke.—The supply of high-grade blast-furnace coke for prompt shipment is limited and prices are firm and higher. It is said that coke has sold at $3 per ton for September delivery for best grades. There is no inquiry for contract coke, as consumers are covered. We now quote best grades of blast-furnace coke for prompt shipment at $2.90 to $3, and on contracts, $2.50 to $2.60 per net ton at oven. We quote best grades of 72-hr. foundry for spot shipment at $3.25 to $3.50, and on contracts, $3.50 to $3.75 per net ton at oven. The Connellsville *Courier* gives the output of coke in the upper and lower Connellsville regions for the week ended Aug. 26 as 397,495 net tons, a decrease over the previous week of 10,565 tons.

Old Material.—The local market continues neglected. None of the large consumers is buying, but the embargo on scrap routed to the Homestead works of the Carnegie Steel Company at Munhall, Pa., was removed Sept. 1, and this is expected to benefit the market. The fact, too, that large quantities of shell steel discards have been taken out of the market by foreign buyers is expected to help heavy steel scrap. Only small sales of heavy steel scrap are being made, ranging from carloads to 200 and 300 tons, and this is bringing $16 to $16.25, delivered. However, if a large consumer wanted to pick up 15,000 to 20,000 tons of selected heavy steel scrap, it is doubtful whether he could get it under $17, and he might have to pay more. We note a sale of 300 tons of low phosphorus melting scrap at $19.50, and 500 tons at $20, delivered. Prices quoted by dealers for delivery in Pittsburgh and points that take the same rates of freight, per gross ton, are as follows:

Heavy steel melting scrap Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh, delivered	$16.00 to $16.25
No. 1 foundry cast	14.50 to 14.75
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	16.50 to 17.00
Hydraulic compressed sheet scrap	13.50 to 14.00
Bundled sheet scrap, sides and ends, f.o.b. consumers' mills, Pittsburgh district	11.25 to 11.50
Bundled sheet stamping scrap	10.25 to 10.50
No. 1 railroad malleable stock	14.50 to 14.75
Railroad grate bars	10.25 to 10.50
Low phosphorus melting stock	19.75 to 20.00
Iron car axles	28.00 to 28.50
Steel car axles	28.00 to 28.50
Locomotive axles, steel	33.00 to 35.00
No. 1 busheling scrap	14.00 to 14.25
Machine-shop turnings	7.00 to 7.25
Old carwheels	13.25 to 13.50
Cast-iron borings	8.00 to 8.25
*Sheet bar crop ends	17.00 to 17.50
No. 1 railroad wrought scrap	18.00 to 18.75
Heavy steel axle turnings	10.50 to 10.75
Heavy breakable cast scrap	12.25 to 12.50

*Shipping point.

Chicago

CHICAGO, ILL., Sept. 6, 1916.—(*By Wire.*)

It is the common report of steel producers that buyers have never been more free in contracting for forward delivery. The size of purchases is being held in check in a number of instances by the irrevocable nature of the sale, but, despite the limitations of capacity under which contracts are being taken by many of the mills, bookings are reported in several instances in excess of shipments. In this activity the steel-using trade is participating quite generally. There is also a continuance of export business both as to inquiry and orders, inquiry coming from India, Japan and Australia, as well as the European countries. In addition to further sales of shipbuilding material for Japan in amounts ranging from 2000 to 10,000 tons, an order for 7000 tons of structural shapes for Canada is reported. Among domestic orders several lots of car steel, one of 10,000 tons for a Western carbuilder, are prominent. New orders for cars include 4000 placed by Russia with the Bettendorf Company and 1000 bought by the Western Pacific. Miscellaneous buying is significant in the revival of a number of postponed undertakings, the opinion apparently prevailing that current high prices will outstay the hope of more favoring conditions. While premium prices are now the exception, despite the inability of a number of mills to ship promptly, the market is unquestionably firmer at the generally prevailing level of prices. The buying movement in pig iron is now in full swing, with many of the larger buyers negotiating for last quarter and first half iron. Minimum prices in the South are higher and quotations from Northern furnaces are following that lead.

Pig Iron.—The aggregate of pig-iron inquiry under consideration is steadily increasing. Negotiations are largely for foundry iron and have to do with the wants of many of the larger buyers, including the principal implement interests. Prices are being quoted on one lot of 2500 tons, another of 4000 tons and various others of sizes ranging within these limits. A fair proportion of sales is being consummated, but the closing of the principal tonnage is still to come. The effect on prices has been most marked in the South, where the minimum furnace quotations for any delivery in the last half now appears to be $14.50 for No. 2, with as high as $15.25 asked for first half 1917 delivery. Furnace reports also show a decided shrinkage in the amount of iron available for sale in the remainder of the year. For Northern foundry iron of competitive grades prices are being determined in accordance with the competition, but for iron of standard Northern analysis, including malleable and basic, $19 is being asked. Quotations as low as $13.75 at Birmingham indicate that some resale iron is still available. For Lake Superior charcoal iron we quote delivery prices at Chicago to include a freight rate of $1.75. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5	$19.75
Lake Superior charcoal, No. 1	20.25
Lake Superior charcoal, No. 6 and Scotch	20.75
Northern coke foundry, No. 1	$19.00 to 19.50
Northern coke foundry, No. 2	18.50 to 19.00
Northern coke foundry, No. 3	18.00 to 18.50
Southern coke, No. 1 f'dry and 1 soft	19.00 to 19.50
Southern coke, No. 2 f'dry and 2 soft	18.50 to 19.00
Malleable Bessemer	19.00
Basic	19.00
Low phosphorus	34.00
Silvery, 8 per cent	29.50
Bessemer ferrosilicon, 10 per cent	32.50

Rails and Track Supplies.—Indications that the leading producer has little or no available capacity for the manufacture of spikes, bolts and angle bars prior to the last quarter of 1917 and of tie-plates before the second quarter have brought out considerable inquiry from the railroads. In respect of rails, there is no current business of importance. Quotations are as follows: Standard railroad spikes, 2.75c., base; track bolts with square nuts, 3.25c. to 3.50c., base, all in carload lots, Chicago; tie-plates, $50, f.o.b. mill, net ton; standard section, Bessemer rails, Chicago, $33, base; open-hearth, $35; light rails, 25 to 45 lb., $40; 16 to 20 lb., $41; 12 lb., $42; 8 lb., $43; angle bars, 2c., Chicago.

Structural Material.—The purchase of 4000 cars for Russia from the Bettendorf Company disposes of the long drawn out negotiations in that connection. The Western Pacific has bought 1000 cars in addition to its inquiry for 1500. The Chicago & Alton has placed 300 cars, and from 300 to 400 have been taken by local meat packing interests. Various other lots of cars of less quantity are reported placed. Carbuilders have been buying steel, one lot of 10,000 tons for the Western Steel Car & Foundry Company and another of 5000 tons for the Pullman Company being noted. Contracts for building projects were few last week, one order for 325 tons going to the Minneapolis Steel & Machinery Company, another for 225 tons to the Wisconsin Bridge & Iron Company and one for 450 tons to the American Bridge Company. Bridge shops very generally are contracting for their first half requirements. We quote for Chicago delivery of plain material from mill 2.889c.

We quote for Chicago delivery of structural steel from jobbers' stock 3.10c.

Plates.—Plates in narrow widths are available for prompt shipment, in some instances as early as one week from several mills, and at prices which represent only nominal premiums. Various orders taken last week were placed at prices ranging from 3.25c. to 3.50c. Wide plates are much more difficult to secure, even some of the jobbers paying 4c. for plates that are resold at the regular price out of store. We quote for Chicago delivery of plates from mill at its convenience 3.189c. For prompt shipment we quote 3.439c. to 3.689c., in widths up to 72 in., and for wide plates 4.189c.

We quote for Chicago delivery of plates out of jobbers' stock 3.50c.

Sheets.—The latest quotations for black sheets indicate a firming up of the market to the extent of about $1 per ton, but prices for galvanized show a disposition to softness, notwithstanding the relatively high spelter cost. For those gages which are midway between the blue annealed and one-pass bases, quotations as low as 4.15c., Pittsburgh, are reported. For both the lighter and heavier gages higher prices rule. One-pass black sheets can be readily had for prompt delivery, as can galvanized as well, from the few mills marketing it, but automobile body sheets and other sheets of special finish continue scarce. We quote for Chicago delivery, blue annealed, No. 16 and heavier, 3.139c. to 3.339c.; box annealed, No. 17 and lighter, 2.989c. to 3.039c.; No. 28 galvanized, 4.289c. to 4.389c.

The price of black sheets out of store has been advanced $3 per ton. We quote for Chicago delivery of sheets out of stock, minimum prices applying on bundles of 25 or more, as follows: No. 10 blue annealed, 3.40c.; No. 28 black, 3.25c.; No. 28 galvanized, 4.65c. to 4.75c.

Bars.—First half contracting for steel bars by the manufacturing trade is rapidly absorbing the capacity reserved by the mills for that purpose. A covering of needs for high carbon bars is also in progress. The bar-iron market continues firm, with some increase in the quantity being booked by the mills. We quote mill shipment, Chicago, as follows: Bar iron, 2.35c.; soft steel bars, 2.789c.; hard steel bars, 2.50c.; shafting, in carloads, 20 per cent off; less than carloads, 15 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 3.10c.; bar iron, 3.10c.; reinforcing bars, 3.10c. base with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting 10 per cent off.

Rivets and Bolts.—The stability of the market with respect to prices of steel bars and wire rods is making easier the maintenance of bolt and nut prices at present levels than when prices were lower. We quote as follows: Carriage bolts up to ⅜ x 6 in., rolled thread, 50-5; cut thread, 40-10-2½; larger sizes, 35-2½; machine bolts up to ⅜ x 4 in., rolled thread, with hot pressed square nuts, 50-10; cut thread, 50; larger sizes, 40-5; gimlet-point coach screws, 50-5; hot pressed nuts, square, $2.70 off per 100 lb.; hexagon, $2.70 off. Struc-

tural rivets, ¾ to 1¼ in., 4c. to 4.15c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 4c.; boiler rivets, 4.10c.; machine bolts up to ¾ x 4 in., 50-10; larger sizes, 40-10; carriage bolts up to ¾ x 6 in., 50-5; larger sizes, 40-5; hot pressed nuts, square, $3.25, and hexagon, $3.25 off per 100 lb.; lag screws, 55.

Wire Products.—The fall demand for wire nails and barb wire is in full swing and specifications are coming in more rapidly by a considerable margin than the movement of materials to the jobbing and retail trade. The dullness in fence buying continues. We quote as follows per 100 lb.: Plain wire, Nos. 6 to 9, base, $2.839; wire nails, $2.789; painted barb wire, $2.939; galvanized barb wire, $3.639; polished staples, $2.939; galvanized staples, $3.639; all Chicago.

Cast-Iron Pipe.—The leading maker of pipe is the low bidder for the contracts for 750 tons of high-pressure and special pipe at Cincinnati, 1800 tons at St. Louis and 300 tons at Hammond, Ind. At Lima, Ohio, the award of 625 tons was to have been made Aug. 31, but no announcement has as yet been made. We quote as follows, per net ton, Chicago: Water pipe, 4-in., $33.50 to $34; 6-in. and larger, $30.50 to $31, with $1 extra for class A water pipe and gas pipe.

Old Material.—Prices of scrap in this market made a rapid advance last week and without much increase in actual buying. Additional interest is being displayed by melters and some buying in small lots has been done, but the advance is still largely one in asking prices by those who hold the scrap. There has been more concern shown by those who have short orders to cover, and the activity in that direction was responsible for most of the transactions. There appears to be more scrap available than has been offered for several weeks, though strictly yard grades are still scarce. Dealers, however, are holding firmly for the higher prices, which in some instances represent advances of $1 per ton. For heavy melting steel $16.50 is commonly asked and there are few offerings of wrought scrap at less than $16.50 per net ton. The Chicago & Northwestern sold about 4000 tons of old material at the end of the week and the Pennsylvania Lines West has a large list. The Chicago, Milwaukee & St. Paul is offering 2500 tons and the Wabash a smaller list. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton

Old iron rails	$18.75 to $19.25
Relaying rails	19.50 to 20.50
Old carwheels	11.50 to 12.00
Old steel rails, rerolling	16.50 to 16.75
Old steel rails, less than 3 ft.	16.50 to 17.00
Heavy melting steel scrap	15.75 to 16.25
Frogs, switching and guards, cut apart	15.75 to 16.25
Shoveling steel	15.25 to 15.75
Steel axle turnings	8.75 to 9.25

Per Net Ton

Iron angles and splice bars	$18.75 to $19.00
Iron arch bars and transoms	20.00 to 20.50
Steel angle bars	14.75 to 15.00
Iron car axles	25.50 to 26.00
Steel car axles	28.00 to 28.50
No. 1 railroad wrought	16.00 to 16.50
No. 2 railroad wrought	15.00 to 15.50
Cut forge	15.00 to 15.50
Pipes and flues	11.75 to 12.25
No. 1 busheling	13.75 to 14.25
No. 2 busheling	9.50 to 10.00
Steel knuckles and couplers	14.75 to 15.00
Steel springs	15.25 to 15.50
No. 1 boilers, cut to sheets and rings	10.25 to 10.75
Boiler punchings	14.00 to 14.50
Locomotive tires, smooth	21.00 to 21.50
Machine-shop turnings	5.50 to 6.00
Cast-borings	6.50 to 7.00
No. 1 cast scrap	12.00 to 12.50
Stove plate and light cast scrap	9.75 to 10.25
Grate bars	10.00 to 10.25
Brake shoes	9.75 to 10.25
Railroad malleable	11.50 to 12.00
Agricultural malleable	11.00 to 11.50

Construction work on the plant of the Chattanooga Steel Company, Chattanooga, Tenn., is being pushed on the return of C. E. James from New York, where he went on matters relating to the financing of the venture. A. B. Stitzer, New York, and E. Payson Cook, Paterson, N. J., are stated to be interested in the company, which has booked orders for a large tonnage of rounds for delivery this winter.

Philadelphia

PHILADELPHIA, PA., Sept. 5, 1916.

The threatened railroad strike had a quieting influence on the market, except where unprofitable activity was caused by requests that shipments be hurried or postponed. The Labor Day holiday also cut down the volume of business. Otherwise the week brought but little change, either in demand or prices. Shipyards which contemplate naval contracts are putting out feelers for prices on plates and shapes they may need, but reports as to the total quantity to be required are contradictory. The great demand for plates, from at home and abroad, continues, but structural shapes drag. Bars are more active and stronger. The price of open-hearth rerolling billets is well established at $48, Eastern mill. Sheets incline toward quiet. In most steel products the range of prices continues notable, much depending on the supply of open-hearth steel which the mills have available and the number of uses they have for it. Pig iron continues active, with steel-making iron especially strong. In foundry iron there are some soft spots. Ferromanganese is easy in the absence of contracting. Spot coke, both furnace and foundry, is scarce. Old material shows no improvement.

Pig Iron.—A goodly tonnage has been taken, mostly in small or moderate-sized lots for delivery in the last or first quarters. While the fear of a railroad strike existed sellers were deluged with requests for immediate shipments. The situation in foundry iron is somewhat contradictory for the reason that, while the majority of producers and their agents assert that the market is steady, with promise of higher prices, others complain of quotations below the minimum acceptable to them, and say that the low sellers have taken business from them. Eastern Pennsylvania No. 2 X is available in some directions at $19.50, delivered, although certain makers insist that their minimum is upward of $20, delivered. In one case 400 tons was negotiated, at a few cents over $20, delivery to be in the last and first quarters. Stove manufacturers have taken around 6000 tons of No. 2 X and No. 2 plain. A Chester pipe works which inquired for 5000 tons of No. 3 and gray forge for delivery this year has not placed its order. The Norfolk & Western Railway has issued an inquiry for 7000 to 8000 tons of miscellaneous grades for the first half of next year, which probably will be divided among Virginia furnaces. A Virginia company which has been building a new furnace that will be blown in some time in November, and has been selling but little from stock for several months, has entered the market again with a view of accumulating orders to fill when operations are resumed. For deliveries to be distributed in even monthly quantities over the last and first quarters it quotes $17.50, furnace, or $20.25, Philadelphia, for No. 2 X. It has sold about 6000 tons in the last 10 days. Another producer, which has large tonnages booked, is asking $1 more. Many large consumers of Virginia and other irons are well bought ahead, and some have not consumed as much as they thought they would. Buffalo producers are reported to be sold for some months ahead. Basic is strong at $19.75 to $20, delivered; the largest inquiry calling for 18,000 tons for delivery at Harrisburg. Standard low phosphorus at $34 to $35, delivered, is stronger than any other grade, and the makers regret that they cannot increase their output. Domestic and foreign consumers, including some in Canada, want low phosphorus. Export inquiries continue to come for various grades, especially Bessemer, a recent one specifying 4000 tons of high silicon Bessemer. Quotations for standard brands, delivered in buyers' yards, prompt shipment, range about as follows:

Eastern Pa. No. 2 X foundry	$19.50 to $20.00
Eastern Pa. No. 2 plain	19.25 to 19.75
Virginia No. 2 X foundry	20.25 to 21.25
Virginia No. 2 plain	20.00 to 20.75
Gray forge	18.50 to 19.00
Basic	19.75 to 20.00
Standard low phosphorus	34.00 to 35.00

Iron Ore.—In the week ended Sept. 2 the only arrival reported consisted of 5760 tons from Chile.

Ferroalloys.—Domestic 80 per cent ferromanganese, made in the electric furnace on the Pacific coast, has

been offered at $168, delivered, while blast-furnace material made in the East is offered at $170. A few carloads of imported ferromanganese have been taken at $175, seaboard. There is no large inquiry and no contracting. Spiegeleisen is quoted at $50, furnace, with the probability that concessions might be obtained. Fifty per cent ferrosilicon is unchanged at $86 to $88, Pittsburgh, and 11 per cent at $34.44, delivered.

Plates.—The larger makers quote 4c., Pittsburgh, or 4.159c., Philadelphia, deliveries at the convenience of the mills. One maker has refused to consider several large inquiries for export, one calling for 10,000 tons of ship plates, one for 6000 tons for shipment to Japan, and another for 5000 to 6000 tons for Italy. Western consumers continue to appeal for plates, but with little or no results. The mill in question asserts that it is sold out to the third quarter of next year on sheared plates, although it can make deliveries in from 6 to 8 weeks on universals. Some consumers are revising their specifications in order to use the latter. Another mill also quotes 4.159c. as its minimum, but a third asks 3.909c., Philadelphia, for nearby deliveries, and 3.659c. for future shipments. The scarcity of open-hearth steel and the variety of uses which various mills have for it govern the situation. Shipyards which build for the Government are requesting plate builders to supply quotations, but the plate makers are awaiting the receipt of new navy specifications. Reports vary as to the quantities which will be required, but it is estimated that the initial part of the naval program will take 150,000 to 200,000 tons of plates and shapes, this in 1917. The entire governmental requirement will be at least 300,000 tons, and possibly 500,000 tons. The Coastwise Shipbuilding Company, Locust Point, Baltimore, Md., is reported to have received an order for five barges for the Philadelphia & Reading Railroad, each 207 ft. long, at a total cost of $400,000.

Bars.—The minimum quotation for open-hearth steel bars is 2.759c., Philadelphia, with some makers asking 2.909c. to 3.159c., Philadelphia, for Bessemer bars. Inquiry is strong from all directions, and many bars rolled from discarded shell steel are being taken. Iron bars are active, but with the price unchanged—2.659c., Philadelphia.

Structural Material.—Shapes continue to lag behind other steel products, both as to price and activity, yet the minimum of 2.759c., Philadelphia, is difficult to obtain by a buyer. A large producer asks 3.009c., Philadelphia, for Bessemer shapes, and up to 3.659c. for open-hearth steel. The contract for a building requiring 700 tons of material to be erected for the E. G. Budd Mfg. Company, Philadelphia, went to the Eastern Bridge & Structural Company, Worcester, Mass. Time dominated the proposition, it being understood that the building is to be completed in 2½ months.

Old Material.—The threatened railroad strike greatly disturbed the market, some consumers wanting shipments made at once, others asking that they be deferred. But little new business was done. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania, and taking freight rates from 35c. to $1.35 per gross ton, are as follows:

No. 1 heavy melting steel	$14.75 to $15.25
Old steel rails, rerolling	17.00 to 18.00
Low phos. heavy melting steel scrap	21.25 to 23.50
Old steel axles (for export)	34.00 to 35.00
Old iron axles (for export)	34.00 to 35.00
Old iron rails	20.00 to 20.50
Old carwheels	15.50 to 16.00
No. 1 railroad wrought	20.00 to 21.00
Wrought-iron pipe	13.50 to 14.00
No. 1 forge fire	12.00 to 12.50
Bundled sheets	12.00 to 12.50
No. 2 busheling	10.50 to 11.00
Machine-shop turnings	7.25 to 7.75
Cast borings	9.00 to 9.50
No. 1 cast	16.00 to 16.50
Grate bars, railroad	11.75 to 12.25
Stove plate	11.75 to 12.25
Railroad malleable	13.50 to 14.00

Billets.—Purchases of some good-sized tonnages have established the market at $48, minimum, Eastern mill, for open-hearth rerolling billets. Forging billets are quoted at $65 f.o.b., Eastern mill.

Sheets.—Except for a few large inquiries, the market is rather quiet. Quotations range from 3.159c. to 3.659c., for No. 10 blue annealed.

Coke.—Foundry coke is difficult to get because of the shortage of labor and cars. Spot furnace coke is not over-plentiful also. For spot furnace the quotation is $2.75 to $2.85 per net ton at oven, and for contract, nominally $2.50. Spot and contract foundry is quoted at $3.25 to $3.50 per net ton at oven. Freight rates from the principal producing districts are as follows: Connellsville, $2.05; Latrobe, $1.85, and Mountain, $1.65.

Cleveland

CLEVELAND, OHIO, Sept. 5, 1916.

Iron Ore.—Another new record in iron-ore shipments from the Lake Superior district was made in August, the lake movement during the month amounting to 9,850,140 gross tons, a gain of 100,000 tons over July. Beginning with May, each of the past four months has broken all previous records for ore shipments, and the shipments during June and July, as well as August, exceed 9,500,000 tons. Duluth made a remarkable showing last month, shipping 3,380,066 tons, a gain of 368,000 tons over July. Some of the other ports show a falling off. Shipments up to Sept. 1 were 39,215,864 tons, or over 7,000,000 tons in excess of those in the corresponding period of the record-breaking season of 1913. Shippers now estimate that the lake movement for the season will be between 61,000,000 and 63,000,000 tons. Some let-up is expected from now on, but it is apparent that unless something develops to interrupt traffic the lake fleet can easily bring the total up to 61,000,000 tons or more. Some additional chartering is being done at $1 free from the head of Lake Superior, and at 90c. from Marquette. We quote iron-ore prices as follows for delivery at lower lake ports: Old-range Bessemer, $4.45; Mesaba Bessemer, $4.20; old-range non-Bessemer, $3.70; Mesaba non-Bessemer, $3.55.

Pig Iron.—A fairly active buying movement in foundry and malleable iron for the first half of 1917 is under way. Buying appears to be quite general in Ohio and surrounding territory with the exception of Michigan, where the market is still rather quiet. A number of large consumers either have covered or are in the market, although in northern Ohio most of the inquiries are coming from the small foundries. The Westinghouse Electric & Mfg. Company has placed orders with Cleveland furnaces for a portion of the first half requirements for its Cleveland plant, which usually amounts to 6000 tons. Another Ohio inquiry for 6000 tons is pending. The market is firm on all grades. Foundry iron is quoted at $18.50, Cleveland and Valley furnace, for first half, and one or two interests are understood to be holding for $19. Southern iron is firmer, and $14.50, Birmingham, is claimed to be the minimum quotation for No. 2 for first half, with some producers asking $15. We quote, delivered Cleveland, as follows:

Bessemer	$21.95
Basic	18.95
Northern No. 2 foundry	18.80
Southern No. 2 foundry	$18.00 to 18.50
Gray forge	18.50
Jackson Co., silvery, 8 per cent silicon	28.62
Standard low phos., Valley furnace	32.00

Coke.—While dull, the market is firm. Foundry coke is held at $3.25 to $3.50 per net ton at oven, the latter being the general quotation for standard makes. Some producers are entirely sold up and out of the market.

Finished Iron and Steel.—The demand for steel for early shipment continues active but deliveries from the mills that have been able to make reasonably prompt shipment are getting further behind, Bessemer bars not being available within four to six weeks and Bessemer shapes not until November. The demand on warehouses continues very heavy, and jobbers report that in most lines August business exceeded that of July. Steel bars are quoted at 2.60c. to 2.75c., Pittsburgh, and structural material 2.70c. to 2.85c. The demand for plates is active and a Cleveland mill is making sales at 4.25c.

to 4.50c., Pittsburgh, for delivery in about two months. For future delivery at the convenience of the mills plates are quoted at 3c. to 3.50c. Not much building work requiring a round tonnage of steel is coming out. Bar iron in unchanged at 2.40c. to 2.50c., Cleveland. Sheets continue in fair demand with prices firm but unchanged. We quote sheets at 2.90c. to 3c., Ohio mill, for No. 28 black; 3c. to 3.25c. for No. 10 blue annealed and 4.15c. to 4.30c. for No. 28 galvanized. Warehouse prices are 3.25c. for structural material; 3.65c. for plates and 3.25c. for iron bars.

Bolts, Nuts and Rivets.—Some large inquiries are pending for bolt and nut requirements for the remainder of the year from the railroads and other consumers. There is little demand from jobbers, who are mostly under contract. Specifications continue heavy. The new demand for rivets is light and specifications are coming out in a large volume. We quote rivets at 4c., Pittsburgh, for structural and 4.10c. for boiler. Bolt and nut discounts are as follows:

Common carriage bolts, ⅝ x 16 in., smaller or shorter, rolled thread, 50 and 5; cut thread, 40, 10 and 2½; larger or longer, 35 and 2½; machine bolts within h. p. nuts, ⅝ x 4 in., smaller and shorter, rolled thread, 50 and 10; cut thread, 50; larger and longer, 40 and 10; lag bolts, gimlet or cone point, 50 and 5; square h. p. nuts, blank or tapped, $2.70 off the list; hexagon h. p. nuts, blank or tapped, $2.70 off; c. p. c. and t. sq. nuts, blank or tapped, $2.40; hexagon nuts, all sizes, $2.80 off; cold pressed semi-finished hexagon nuts, all sizes, 60 and 5.

Old Material.—The unsettled condition due to the threatened railroad strike had its effect on the scrap market for several days, and as yet there has been no recovery from the dullness and weakness. However, with the strike menace removed there is an improved feeling in the trade and more activity is looked for this week. Cleveland mills are out of the market, so that local dealers are depending almost entirely on outside consumers for orders. Canton has made additional purchases of heavy melting steel and is credited with buying about 8000 tons in all for September, October and November delivery, paying as high as $17 for some. Local sales of heavy melting steel are reported to dealers covering on contracts at $15.75, which is a higher price than the mills are willing to pay. Quotations are unchanged. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton

Steel rails	$14.75 to $15.00
Iron rails	18.50 to 19.00
Steel car axles	32.00 to 33.00
Heavy melting steel	15.00 to 15.50
Carwheels	12.75 to 13.00
Relaying rails, 50 lb. and over	22.50
Agricultural malleable	12.50 to 12.75
Railroad malleable	14.00 to 14.25
Steel axle turnings	12.00 to 12.50
Light bundled sheet scrap	12.00 to 12.25

Per Net Ton

Iron car axles	$24.00 to $25.00
Cast borings	5.75 to 6.00
Iron and steel turnings and drillings	5.25 to 5.50
No. 1 busheling	11.00 to 11.25
No. 1 railroad wrought (nominal)	15.00 to 15.50
No. 1 cast	13.00 to 13.50
Railroad grate bars	10.00 to 10.50
Stove plate	10.00 to 10.25

Cincinnati

CINCINNATI, OHIO, Sept. 6, 1916.—(*By Wire.*)

Pig Iron.—Southern prices continue to gain strength and the majority of furnaces are now quoting and selling iron at $14.50, Birmingham basis, for this year's shipment and from $14.50 to $15 for delivery in the first half of next year. However, there is still some No. 2 foundry obtainable at $14 for prompt shipment. Resale iron in the South is getting scarcer and is now not much of a factor in the regulation of prices. The heavy buying of foundry iron has put the Southern producers in a more independent position, and it is stated that $14 iron either from furnaces or speculators will shortly be unobtainable. The general inquiry is good and it is not now necessary for salesmen to rake over their territories for business as was the case less than two months ago. The Standard Sanitary Mfg. Company has put out an inquiry for approximately 8000 tons of foundry iron, part of which will be shipped this year, and from Indiana there are three inquiries for quantities ranging all the way from 500 to 1000 tons. In central Ohio other foundry melters are getting interested. Recent sales include 3000 tons of Southern foundry iron to a northern Ohio melter, 1000 tons to a central Ohio consumer and 600 tons to a local foundry. Approximately 2000 tons of Southern iron was contracted for by an Indiana manufacturer. A few small sales of Lake Superior charcoal have been made recently and there is more business pending. Malleable is still active, but with the exception of one sale of a fair-sized tonnage no transactions of note have been made here lately. Northern No. 2 foundry is still being sold at $18, Ironton, with shipments extended into the first half of next year. Based on freight rates of $2.90 from Birmingham and $1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft	$17.40 to $18.40
Southern coke, No. 2 f'dry and 2 soft	16.90 to 17.90
Southern coke, No. 3 foundry	16.40 to 17.40
Southern coke, No. 4 foundry	15.90 to 16.90
Southern gray forge	15.40 to 16.40
Ohio silvery, 8 per cent silicon	28.26 to 28.76
Southern Ohio coke, No. 1	20.26 to 20.76
Southern Ohio coke, No. 2	19.26 to 19.76
Southern Ohio coke, No. 3	18.76 to 19.26
Southern Ohio malleable Bessemer	19.26 to 19.76
Basic, Northern	19.26 to 19.76
Lake Superior charcoal	21.20 to 22.20
Standard Southern carwheel	24.90 to 25.40

(By Mail)

Coke.—The threatened railroad strike caused a number of foundries to urge shipments of coke so that yard stocks are probably heavier than for some time. However, this movement had no appreciable effect on prompt shipment prices, which are now the same as contract figures. Connellsville operators are holding 72-hr. coke around $3.25 to $3.50 per net ton at oven, and Pocahontas and Wise County brands are firmer at $3.50 to $3.65. New River foundry coke is still quoted around $4 at oven. No furnace coke business has lately been transacted in this immediate territory and Connellsville grades are quoted at $2.50 to $2.75 at oven.

Finished Material.—Both black and galvanized sheets are firmer. Nearby mills are quoting from 4.40c. to 4.50c., Cincinnati or Newport, Ky., on No. 28 galvanized, and only very acceptable orders would be booked at the inside figure. Black sheets are around 3c. for No. 28. Business is said to be good, but the mills are not encouraging customers to order very far ahead, and are confining their efforts to take care of old customers who are specifying heavily on contracts. The jobbers are complaining that it is almost impossible to get prompt shipments from the mills on some kinds of rivets as well as bolts and nuts. As a consequence quotations on different articles are somewhat erratic and depend principally on the ability of the seller to obtain the goods. Jobbers' quotations are as follows: Steel bars and small structural shapes, 3.20c.; twisted steel bars, 3.35c.; wire nails, $2.85 per keg base; barb wire, $3.70 per 100 lb., and No. 10 blue annealed sheets, 3.50c.

Old Material.—Iron axles and locomotive tires are about the only two grades of scrap that are stronger, but no change has been made in previous quotations. Steel turnings may be said to be a trifle firmer. There is no appreciable increase in the demand from any particular source. Yard stocks are heavy and are increasing at a slow rate. The following are dealers' prices f.o.b. at yards, southern Ohio and Cincinnati:

Per Gross Ton

Bundled sheet scrap	$10.25 to $10.75
Old iron rails	15.50 to 16.00
Relaying rails, 50 lb. and up	21.00 to 21.50
Rerolling steel rails	14.50 to 15.00
Heavy melting steel scrap	14.00 to 14.50
Steel rails for melting	13.00 to 13.50

Per Net Ton

No. 1 railroad wrought	$13.50 to $14.00
Cast borings	4.50 to 5.00
Steel turnings	4.75 to 5.25
Railroad cast scrap	11.00 to 11.50
No. 1 machinery cast scrap	12.75 to 13.25
Burnt scrap	8.25 to 8.75
Iron axles	24.00 to 25.00
Locomotive tires (smooth inside)	20.75 to 21.25
Pipes and flues	9.25 to 9.75
Malleable and steel scrap	10.75 to 11.25
Railroad tank and sheet scrap	8.25 to 8.75

Birmingham

BIRMINGHAM, ALA., Sept. 4, 1916.

Pig Iron.—The second week of the new buying movement closed with sales of about 100,000 tons of Southern pig iron. Fully 60,000 tons was booked in the Birmingham district the past week, with the Sloss-Sheffield Steel & Iron Company, the Alabama Company and the Woodward Iron Company the chief sellers. One company sold 6000 tons of special iron. The Tennessee Coal, Iron & Railroad Company is accepting but few orders. Sales are being made at $14.50 to $15 for No. 2 foundry, and sellers are finding it easier to get $15. Some of the iron just sold is for 1917 first quarter delivery. While some hope is expressed that $15.50 might be obtained for 1917 delivery, the general feeling is that iron will be firm at $15, with some sales made at $14.50. Practically all producers, with the exception of the Tennessee Company, are getting some business from Holland, Norway, Sweden, France and Italy. Inquiries are numerous. The car shortage continues serious. Etowah furnace No. 2 of the Alabama Company, Gadsden, was blown in this week. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	$15.00 to $15.50
No. 2 foundry and soft	14.50 to 15.00
No. 3 foundry	14.00 to 14.50
No. 4 foundry	13.75 to 14.25
Gray forge	13.50 to 14.00
Basic	14.50 to 15.00
Charcoal	22.00 to 22.50

Cast-Iron Pipe.—A more hopeful feeling has been engendered by the decision of the Interstate Commerce Commission suspending the new transcontinental tariffs from Sept. 1 until Dec. 30. The rate to Pacific coast terminals would have been increased from $11 to $17.60 a ton, and would have been a severe blow to the market. The demand continues steady, with no striking features. Several carloads of pipe were shipped the past week to the Pacific coast. We quote, per net ton, f.o.b. pipe shop yards, as follows: 4-in., $28; 6-in., and upward, $25, with $1 added for gas pipe and 16-ft. lengths.

Coal and Coke.—Several coal mines were forced to close down last week on account of the car shortage, which is severely crippling business. The coke market is in excellent shape, with the demand taking everything offered. Business with Mexico, discontinued some time ago when trouble between that country and the United States seemed imminent, has been resumed in part. Standard beehive coke is selling at $4.25 to $4.50 per net ton at oven and furnace coke at $3.25 to $3.50, with much of it being taken at $3.50.

Old Material.—Sales have been heavier, but with no change in prices. The tendency is toward a stronger demand. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old steel axles	$24.00 to $30.00
Old steel rails	10.00 to 10.50
No. 1 steel scrap	9.25 to 9.75
No. 1 wrought scrap	12.50 to 13.00
No. 1 cast scrap	10.50 to 11.00
Extra heavy cast scrap	9.50 to 10.00
Stove plate and light	9.00 to 9.50
Old carwheels	9.50 to 10.00
Tram carwheels	9.50 to 10.00

St. Louis

ST. LOUIS, MO., Sept. 4, 1916.

Pig Iron.—The demand for iron for the remainder of this year, and especially for the first half of next year, has spread to foundrymen of all classes. The market has been filled with small inquiries on which numerous sales have been made, while still others are pending. At the same time some of the larger inquiries which were pending at the beginning of the week and on which quotations have been made have been held over until the purchasers feel absolutely certain that a railroad strike is not to confront them, with its attendant effect upon their own trade as well as the delivery of their purchases. Among the inquiries were one for 1000 tons of charcoal iron and two for an aggregate of about 6000 tons of malleable.

Coke.—Transactions have been few and for small lots. By-product coke is in control of the local situation, to a large extent, but prices are held on a parallel with Connellsville and Virginia quotations.

Finished Iron and Steel.—The market has shown no receding tendencies in either the pressure for the delivery of material already specified or the demand for future deliveries, but the situation of the mills as to the latter is continuing to drive purchasers to the warehouses, where the higher price is freely paid for immediate delivery. Light rails are in active request, particularly from coal companies, while lumbermen are showing a little more interest in the market. For stock out of warehouse we quote as follows, the figures being very firmly held: Soft steel bars, 3.15c.; iron bars, 3.05 to 3.10c.; structural material, 3.15c.; tank plates, 3.55c.; No. 10 blue annealed sheets, 3.45c.; No. 28 black sheets, one pass, cold rolled, 3.45c.; No. 28 galvanized sheets, black sheet gage, 4.80 to 5c., this latter being largely under the influence of the spelter market.

Old Material.—Dealers have had an off week, so far as real business is concerned, none of their customers being inclined to buy, while the railroads have withheld their lists temporarily in order not to offer any occasion for additional complications in the movement of freight during the strike threat's pendency. Dealers, however, are holding their prices firmly, with an expectation of advances with the lifting of railroad embargoes and the further clarifying of the railroad situation. Relaying rails, standard section, are in very sharp demand, with the supply practically nil. We quote dealers' prices, f.o.b. customers' works, St. Louis industrial district, as follows:

Per Gross Ton

Old iron rails	$16.25 to $16.75
Old steel rails, rerolling	15.00 to 15.50
Old steel rails, less than 3 ft	15.00 to 15.50
Relaying rails, standard section, subject to inspection	23.00 to 24.00
Old carwheels	11.50 to 12.00
No. 1 railroad heavy melting steel scrap	15.00 to 15.50
Heavy shoveling steel	13.50 to 14.00
Frogs, switches and guards cut apart	14.50 to 15.00
Bundled sheet scrap	8.00 to 8.50

Per Net Ton

Iron angle bars	$16.00 to $16.50
Steel angle bars	13.50 to 14.00
Iron car axles	26.00 to 26.50
Steel car axles	27.00 to 27.50
Wrought arch bars and transoms	21.00 to 21.50
No. 1 railroad wrought	15.50 to 16.00
No. 2 railroad wrought	15.00 to 15.50
Railroad springs	15.00 to 15.50
Steel couplers and knuckles	14.00 to 14.50
Locomotive tires, 42 in. and over, smooth inside	20.50 to 21.00
No. 1 dealers' forge	10.25 to 10.75
Cast-iron borings	7.00 to 7.50
No. 1 busheling	13.50 to 14.00
No. 1 boilers, cut to sheets and rings	9.50 to 10.00
No. 1 railroad cast scrap	11.00 to 11.50
Stove plate and light cast scrap	8.75 to 9.25
Railroad malleable	11.00 to 11.50
Agricultural malleable	10.00 to 10.50
Pipes and flues	11.00 to 11.50
Railroad sheet and tank scrap	9.75 to 10.25
Railroad grate bars	9.50 to 10.00
Machine shop turnings	7.00 to 7.50

Buffalo

BUFFALO, N. Y., Sept. 6, 1916.—(*By Wire.*)

Pig Iron.—The week shows a lull in buying compared with past three weeks. Still there has been a total of 25,000 to 30,000 tons placed in the Buffalo district in the past week, of foundry grades and basic and Bessemer. One selling interest has disposed of considerable quantities of special irons. Of the 15,000 tons of foundry iron placed by the Worthington Pump & Machinery Company last week, a portion was taken by Buffalo furnaces. Most producers of the district are now very stiff in their prices, one interest being entirely sold up and out of the market. The price range, however, continues about the same as last week. We quote as follows, f.o.b. Buffalo furnace, for last half and first half of next year:

No. 1 foundry	$19.00 to $20.00
No. 2 X foundry	18.50 to 19.50
No. 2 plain	18.50 to 18.75
No. 3 foundry	18.25 to 18.75
Gray forge	18.25 to 18.50
Malleable	18.50 to 19.00
Basic	19.00 to 19.50
Bessemer	21.00 to 21.50
Charcoal, regular brands and analysis	21.00 to 22.00

Finished Material.—No cancellations are reported of August quotas, but specifications are being made for full amounts. Buyers are convinced there will be no weakness for some time to come. Quiet inquiries are being made regarding requirements extending into next year, particularly for first quarter. Mills are unable to book additional tonnage for this year, and in practically all instances new business is accepted for shipment at mills' convenience only, which on most products represents eight to ten months. The John W. Cowper Company, Buffalo, is placing 200 tons reinforcing bars for the Buffalo General Hospital. Bids are being taken for 100 tons of shapes for the Gerhardt-Lang brewery, Buffalo; 120 tons for cattle sheds at the Erie County farm; 1200 tons for a bascule bridge at Abbott Road over the Buffalo River, and for 300 tons for a lift bridge at Minetto, N. Y., over the Erie Canal. The Progressive Structural Steel Company, Buffalo, has taken 200 tons for store and loft building for J. A. Cramer, Buffalo.

Old Material.—No change in prices is noted. The market is still holding strong, though there was a temporary lull in inquiry and sales for several days pending the outcome of the threatened railroad strike. Business has rapidly resumed normal proportions. The principal demand is for heavy melting steel. A shortage is anticipated and prices are expected to advance within a brief period. There is still a pronounced demand for old steel axles for export, and $30 per ton could be secured if any were available. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel	$15.50 to $16.00
Low phosphorus steel	20.00 to 20.50
No. 1 railroad wrought scrap	17.25 to 17.75
No. 1 railroad and machinery cast scrap	15.50 to 16.00
Steel axles	26.00 to 26.50
Iron axles	24.00 to 24.50
Carwheels	13.00 to 13.50
Railroad malleable	15.00 to 16.00
Machine shop turnings	6.00 to 6.50
Heavy axle turnings	12.00
Clean cast borings	7.50 to 7.75
Iron rails	18.00 to 18.50
Locomotive grate bars	11.50 to 12.00
Stove plate (net ton)	11.00 to 11.50
Wrought pipe	12.00 to 12.50
Bundled sheet scrap	11.50 to 12.00
No. 1 busheling	13.00 to 13.50
No. 2 busheling	11.00 to 11.50
Bundled tin scrap	15.00 to 15.50

New York

NEW YORK, Sept. 6, 1916.

Pig Iron.—Quite a little of the business that has been before the market for the last two or three weeks was closed up just before Sept. 1. The pump company that some time ago took bids on 15,000 to 16,000 tons for the first half of 1917, and as much more for the second half, is understood to have bought, but only up to the middle of the year. Quite a good deal of this business went to western Pennsylvania and a relatively small amount to Buffalo. A New Jersey foundry that has been asking for 5000 tons for first half took all of this and perhaps more, some of the iron going at $20, delivered. In Brooklyn several hundred tons of western Pennsylvania iron was bought at slightly over $20, delivered, figuring back to a little over $18 at furnace for No. 2. The American Locomotive Company is in the market for about 5000 tons for Schenectady and Dunkirk. New inquiry from nearby New Jersey points includes 1500 tons for the manufacture of heating castings, 1000 tons from another foundry and 500 tons from each of two others. Pennsylvania and northern New York furnaces have taken quite a little of the recent New Jersey business. In New England a jobbing foundry has bought several thousand tons for first quarter delivery. Alabama furnaces have done some business in New England around $20 for No. 2 for 1917 delivery. In Virginia some sales of furnace iron have been made at $17.75 at furnace for No. 2 X, though resale Virginia iron has been sold at considerably less, as low as $16.75 in one case. In western New York some basic iron has been taken by a coupler company, Buffalo and Valley furnaces being sellers. The market is still irregular, some evidence appearing of a firmer attitude by furnaces, while in other cases concessions are made. On the whole there is a slight gain in strength. We quote at tidewater for early delivery: No. 1 foundry, $20 to $20.50; No. 2 X, $19.50 to $19.75; No. 2 plain, $19.25 to $19.50; Southern iron at tidewater, $19.25 to $19.75 for No. 1 and $18.75 to $19.25 for No. 2 foundry and No. 2 soft.

Ferroalloys.—The ferromanganese market is lifeless, with very few inquiries and fewer sales, only a few carload lots being sold at about $175, seaboard. Little more is heard of possible restrictions of British shipments. Receipts are reported as very good, with specifications on contracts insistent. Some dealers, however, are behind in their deliveries. Little is heard of domestic offerings or sales, though it is understood some domestic product is obtainable at $175 or less, delivered. Fifty per cent ferrosilicon is active, with users urging forward metal under contract.

Finished Iron and Steel.—The withdrawal of quotations on plain material mentioned last week resulted in a number of additional awards for fabricated building work, and it is understood that plain material must now be figured at 2.60c., Pittsburgh, as a minimum. New work continues to appear, indicating urgent construction and also an acceptance of present price levels. Conspicuous are the following: A Paterno apartment to occupy part of the Grand Central Terminal area and involving 9000 to 10,000 tons; 4700 tons for the Norfolk Navy Yard; 700 tons for the Chespeake & Ohio; 500 tons for a warehouse for the Seaboard at Savannah, and 400 tons for a boiler house at Baltimore for the Consolidated Gas, Light & Power Company. For the present the substructure for the Paterno apartment is alone under consideration, taking 3500 tons, largely plate girder work. On Sept. 13, bids will be taken on 2340 tons for the Eastern Parkway subway in Brooklyn. Meanwhile it is believed that the hotel in Washington will not be put through on account of cost and the Baltimore hotel project has not yet been financed. The New York Central is in the market for about 300 tons of bridge work and the New York & Harlem is expected in the course of several weeks to take figures on upward of 4500 tons for an office building on the Grand Central Terminal area. A building for the White Motor Sales Corporation, Fifty-seventh Street, taking 300 tons, is mentioned as an early likelihood. Among awards are the following: Hedden Iron Construction Company, 400 tons for the General Electric at Lynn, Mass.; 250 tons for a powerhouse for the Queensboro Company at Far Rockaway and about 100 tons for the Continental Paper Company at Bogota, N. J.; American Bridge Company, 200 tons for the Bosch Magneto Company at Springfield, Mass., and 1000 tons for the Philadelphia Electric office building; A. E. Norton, Inc., 700 tons for Borchardt apartment, Seventy-fifth Street and Park Avenue, and 600 tons for a Bing & Bing building on West Seventy-first Street, leaving open still another Bing & Bing job, of 600 tons, on West Sixtieth Street; Passaic Structural Steel Company, 650 tons for the T. J. McLaughlin building at 105th Street and Broadway; New England Structural Company, 700 tons for the Ditson building, Boston; Phoenix Bridge Company, 400 tons for the Congoleum Company, Marcus Hook, and 100 tons for the Reading; and Pennsylvania Steel Company, 1100 tons for Snare & Triest for the Blackwell's Island storehouse. Another buyer of shipbuilding material for merchant vessels has established himself in New York in the person of James Donald, general manager of the States Marine & Commercial Company, Inc., 17 Battery Place, New York. In export buying at this writing it may be stated that many more cars are yet to be bought by Russia, more rails for the same country are under consideration, but a plan involving 10,000 tons of barb wire and 30,000 tons of ¾-in. rounds for Italy has been abandoned. We quote mill shipments of plain structural material at 2.769c. to 3.019c. New York for delivery in two to three months; steel bars at 2.769c. for delivery at convenience of the mill and as high as 3.169c. for say three months and limited largely to Bessemer steel; bar iron, 2.669c., and steel plates at

3.169c. to 4.169c., the wider the plates and the earlier the delivery, the higher the price. Out of store we quote iron and steel bars and shapes at 3.25c., New York, and plates 4c.

Cast-Iron Pipe.—The most interesting feature of the market is the increase in inquiries for export. The Southern pipe foundries have heretofore been most favored with orders for foreign shipment, but indications are favoring the diversion of some of this trade to Northern foundries. No large municipal lettings have come out and private buying is of but moderate volume. Prices are well held. Carload lots of 6-in., class B and heavier, are quoted at $30.50 per net ton, tidewater, class A and gas pipe taking an extra of $1 per ton.

Old Material.—About the only change for the better is in such materials as are wanted for export. Relaying rails, rerolling rails and car axles are in especially good demand for shipment to foreign buyers. In the domestic trade the iron rolling mills in eastern Pennsylvania are the only consumers taking much interest in the market and the demand from them is more for specialties than for staple commodities. Western Pennsylvania consumers are taking practically nothing from this market and brokers state that $12.60, New York, is about the best that could be paid at present for heavy melting steel scrap to be shipped to the Pittsburgh district. They quote buying prices for the Eastern trade about as follows to local dealers and producers, per gross ton, New York:

Heavy melting steel scrap (eastern Pennsylvania specifications)	$11.75 to $12.00
Old steel rails (short lengths) or equivalent	12.50 to 12.75
Relaying rails	27.50 to 28.00
Relaying rails (for export)	30.00 to 32.00
Rerolling rails	16.75 to 17.00
Rerolling rails (for export)	19.00
Iron car axles (for export)	35.00
Steel car axles (for export)	37.00
No. 1 railroad wrought	18.50 to 18.75
Wrought-iron track scrap	15.50 to 16.00
No. 1 yard wrought, long	13.50 to 14.00
No. 1 yard wrought, short	11.75 to 12.00
Light iron (nominal)	3.50 to 4.00
Cast borings (clean)	6.75 to 7.00
Machine shop turnings (nominal)	4.25 to 4.50
Mixed borings and turnings	4.25 to 4.50
Wrought pipe	11.25 to 11.50
Old carwheels (nominal)	15.00 to 15.50
Malleable cast (railroad)	12.00 to 12.50

Foundries are purchasing only moderate quantities. Dealers' quotations to consumers of cast scrap are as follows, per gross ton, New York:

No. 1 cast (machinery)	$15.75 to $16.00
No. 2 cast (heavy)	14.00 to 14.50
Stove plate	11.50 to 12.00
Locomotive grate bars	10.00 to 10.25

British Steel Market

Billets Much Higher—Italian Pig-Iron Orders Diverted to America

LONDON, ENGLAND, Sept. 6, 1916.—(*By Cable.*)

The pig-iron market is strong, with forward sales restricted. Large sales of Cleveland iron have been made to France, but new Italian business has been diverted to the United States. American billets are dearer, with independent producers practically sold out for this year. Four-in. billets for December delivery have sold at $65, c. i. f. Liverpool, but now $68 is quoted for January-March delivery. France has bought for prompt delivery 1¾-in. billets at £16, c. i. f. net. Tin plates are irregular, with government orders at 30s. and upwards, and stock plates at 37s. Benzol, 90 per cent, at 1s. 1½d., and toluol at 2s. 3d., are unchanged, and solvent naphtha is nominal at 1s. 10d. to 2s. Ammonium sulphate is quoted at £16 15c. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 33s. to 35s.
Steel black sheets, No. 28, export, f.o.b. Liverpool, £20 5s.
Steel ship plates, Scotch, delivered local yards, £13 17s. 6d.
Steel rails, export, f.o.b. works, £10 17s. 6d.
Hematite pig iron, f.o.b. Tees, about 140s.
Sheet bars (Welsh) delivered at works in Swansea Valley, £10 7s. 6d.
Steel bars, export, f.o.b. Clyde, £18.
Ferromanganese (nominal), £35.
Ferrosilicon, 50 per cent, c.i.f., £29.

Iron and Industrial Stocks

NEW YORK, Sept. 6, 1916.

The stock market of the past week fluctuated considerably. The threatened railroad strike presented new conditions from day to day, which alternately caused weakness and strength in industrial stocks. On Thursday United States Steel common attained 99⅜, but it dropped on the following days, rising on Tuesday of this week to 99. Other industrial stocks were also quite strong. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com.	22 - 24½	N. Y. Air Brake	134 -136½
Allis-Chal., pref.	78 - 79	Pitts. Steel, pref.	98 - 98¾
Am. Can, com...	58½- 63¼	Pressed Stl., com.	51½- 54
Am. Can, pref...	112 -115	Pressed Stl., pref.	101 -101¾
Am. Car & Fdy., com.	60½- 63	Ry. Steel Spring, com.	44¼- 46½
Am. Car & Fdy., pref.	117 -118½	Republic, com...	51 - 54½
Am. Loco., com.	74¼- 77¼	Republic, pref...	113½-114
Am. Loco., pref..	104 -105⅞	Pipe, com.	19¼- 20
Am. Steel Fdries.	53¼- 53¾	Pipe, pref.	52⅝
Bald. Loco., com.	76 - 80¾	U. S. Steel, com..	95 - 99⅝
Bald. Loco., pref.	104 -104½	U. S. Steel, pref..	117⅝-118½
Beth. Steel, com.	480 -487	Westing. Elec...	57¾- 60
Colo. Fuel.....	45⅞- 49¼	Am. Rad., com..	396 -397
Deere & Co., pref.....	90	Am. Ship, com..	47 - 49
Gen. Electric....	167 -170¼	Chic. Pneu. Tool.	70 - 71¾
Gt. No. Ore Cert.	36⅛- 38¾	Lake Sup. Corp..	10½- 10⅞
Int. Harv. of N. J., com.	114 -116½	Cruc. Steel, com.	73 - 78½
Int. Harv. of N. J., pref.	118 -118½	Cruc. Steel, pref.	116¼-118
Int. Harv. Corp., pref.	108	Harb.-Walk. Refrac., pref.	102 -104
Lacka. Steel.....	75 - 78½	La Belle Iron, com.	55⅜- 56½
Nat. En. & Stm., com.	23½- 25	La Belle Iron, pref.	133¼-133½
		Driggs-Seabury .	65 - 80
		Midvale Steel....	61½- 62¾

Dividends

The American Car & Foundry Company, regular quarterly, ½ of 1 per cent. on the common and 1¾ per cent on the preferred stock, payable Oct. 2.

The American Can Company, regular quarterly, 1¾ per cent on the preferred stock, payable Oct. 1.

The Driggs-Seabury Ordnance Company, regular quarterly, 1¾ per cent on the first preferred stock and 1½ per cent on the second, payable Sept. 15. The dividend on the common stock was passed, although earnings were more than sufficient to pay it.

The Wheeling Steel & Iron Company, regular quarterly, 2 per cent and an extra of 1 per cent on the preferred stock.

The American Locomotive Company, quarterly, 1¼ per cent on the common stock, payable Sept. 28, being the first dividend declared on the common stock since 1908, and regular quarterly, 1¾ per cent on the preferred stock, payable Oct. 21.

The Dominion Iron & Steel Company, Ltd., 3½ per cent on the preferred stock for the half year ended April 1, 1916, and 3½ per cent additional for the half year to end, or Oct. 1, 1916. This action clears the slate of arrears on the preferred.

The American Iron & Steel Mfg. Company, regular quarterly, 1¼ per cent on the common and preferred stocks, payable Oct. 2.

The Bethlehem Steel Company, regular quarterly, 7½ per cent on the common stock and 1¾ per cent on the preferred stock, payable Oct. 2.

The Cambria Iron Company, 2 per cent, payable Oct. 2.

The Hendee Mfg. Company, regular quarterly, 1¾ per cent on the preferred stock, payable Oct. 2.

Pettibone, Milliken & Co., Inc., regular quarterly, 1¾ per cent on the first and second preferred stocks, payable Oct. 1.

The Scovill Mfg. Company, extra 10 per cent, payable Sept. 1.

The Worthington Pump & Machinery Corporation, 1¾ per cent on the preferred A stock, payable Oct. 2.

The Chandler Motor Company, regular quarterly, 2 per cent and extra 1 per cent, payable Oct. 2.

The Continental Can Company, regular quarterly, 1¼ per cent on the common and 1¾ per cent on the preferred stock.

Japan as a Source of Tungsten

Exports of tungsten ore from Japan in 1915 were 85 tons to the United States, 214 tons to France, and 110 tons to the United Kingdom, or 409 tons in all. Estimated shipments to July 20, 1916, are placed at 480 tons, most of it going to the United States. The tungsten output of Japan is reported as 25 to 40 tons of ore per month from the Kiwada mine, 10 to 11 tons per month from the Takitori mine, and 75 tons per month from several small mines. Those in Corea produce between 50 and 60 tons per month. Attempts were made to obtain tungsten from Siam, but the ore contained large percentages of tin, greatly reducing the value.

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, effective from April 10, 1916, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30.7c.; Birmingham, Ala., 45c.; Pacific coast (by rail only), 65c.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees 3 in. and over, 2.60c. to 2.75c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs	.10
Angles, 3 in. on one or both legs less than ¼ in. thick, as per steel bar card, Sept. 1, 1909	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail)	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909	.20 to .80
Deck beams and bulb angles	.30
Handrail tees	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft	1.55

No charge for cutting to lengths 3 ft. and over.

Plates.—Tank plates, ¼ in. thick, 6 in. up to 100 in. wide, 3c. to 4c., base, net cash, 30 days, or ½ of 1 per cent discount in 10 days, carload lots. Extras are:

Quality Extras

	Cents per lb.
Tank steel	Base
Pressing steel (not flange steel for boilers)	.10
Boiler and flange steel plates	.15
"A. B. M. A." and ordinary firebox steel plates	.20
Still bottom steel	.30
Locomotive firebox steel	.50

Marine steel, special extras and prices on application.

Gage Extras

	Cents per lb.
Rectangular, 1¼ in. thick, over 6 in. wide to 100 in. wide	Base
Lighter than ¼ in., to 3/16 in., up to 72 in wide	.10
*Lighter than ¼ in., including 3/16 in., over 72 in. to 84	.20
*Lighter than ¼ in., including 3/16 in., over 84 in. to 96	.30
*Lighter than ¼ in., including 3/16 in., over 96 in. to 100	.40
*Lighter than ¼ in., including 3/16 in., over 100 in. to 102	.45
Lighter than 3/16 in., including No. 8, up to 72 in. wide	.15
*Lighter than 3/16 in., including No. 8, over 72 in. to 84	.25
*Lighter than 3/16 in., including No. 8, over 84 in. to 96	.35
Lighter than No. 8, including No. 10, up to 60 in. wide	.30
Lighter than No. 8, including No. 10, over 60 in. to 64	.35

Up to 72 in. not less than 10.2 lb. per sq. ft. will be considered ¼ in.
Over 72 in. must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft. to take base price.
Over 72 in. wide, ordered less than 11 lb. per sq. ft., down to weight of 3/16 in., take price of 3/16 in.
Over 72 in., ordered weight 3/16 in., take No. 8 price.
Over 72 in., ordered weight No. 8, take No. 10 price.

Width Extras

Over 100 in. to 110 in., inclusive	.05
Over 110 in. to 115 in. inclusive	.10
Over 115 in. to 120 in. inclusive	.15
Over 120 in. to 125 in. inclusive	.25
Over 125 in. to 130 in. inclusive	.50
Over 120 in.	1.00

Length Extras

Universal plates 80 ft. long up to 90 ft. long	.05
Universal plates 90 ft. long up to 100 ft. long	.10
Universal plates 100 ft. long up to 110 ft. long	.20

Cutting Extras

No charge for rectangular plates to lengths 3 ft. and over

Lengths under 3 ft. to 2 ft. inclusive	.25
Lengths under 2 ft. to 1 ft. inclusive	.50
Lengths under 1 ft.	1.55
Circles 3 ft. in diameter to 100 in.	.30
Circles over 100 to 110 in. (width extra)	.35
Circles over 110 to 115 in. (width extra)	.40
Circles over 115 to 120 in. (width extra)	.45
Circles over 120 to 125 in. (width extra)	.55
Circles over 125 to 130 in. (width extra)	.80
Circles over 130 in. (width extra)	1.30
Circles under 3 ft. to 2 ft. inclusive	.55
Circles under 2 ft. to 1 ft. inclusive	.80
Circles under 1 ft.	1.85
Half circles take circle extras.	
Sketches, not over four straight cuts, inc. straight taper	.10
Sketches having more than four straight cuts	.20

Plates sheared to a radius take complete circle extras.

*Including extra for width.

Wire Rods.—Including chain rods, $55 to $60.

Wire Products.—Prices to jobbers effective Aug. 5: Fence wire, Nos. 6 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, $2.55; galvanized, $3.25. Galvanized barb wire and staples, $3.45; painted, $2.75. Wire nails, $2.60. Galvanized nails, 1 in. and longer, $2 advance over base price; shorter than 1 in., $2.50 advance over base price. Cement-coated nails, $2.50. Woven wire fencing, 61⅔ per cent off list for carloads, 60½ off for 1000-rod lots, 59½ off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	6 to 9	10	11	12&12½	13	14	15	16
Annealed	$2.60	$2.65	$2.70	$2.75	$2.85	$2.95	$3.05	$3.15
Galvanized	3.30	3.35	3.40	3.45	3.55	3.65	4.10	4.20

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect on black pipe from April 21, 1916, and on galvanized pipe from July 24, 1916, all full weight:

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛, ¼ and ⅜	63	35½	⅛ and ¼	52	24
½	67	51½	⅜	53	25
¾ to 3	70	55½	½	57	38
			¾ to 1½	60	43

Lap Weld

2	65	50½	1¼	48	31
2½ to 6	68	53½	1½	54	38
7 to 12	65	49½	2	55	39
13 and 14	63½	..	2½ to 4	57	42
15	51	..	4½ to 6	57	42
			7 to 12	56	41

Reamed and Drifted

1 to 3, butt	68	53½	¾ to 1½, butt	55	37
2, lap	63	48½	1¼, lap	43	25
2½ to 6, lap	66	51½	1½, lap	49	32
			2, lap	50	33
			2½ to 4, lap	52	36

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	59	40½	⅛, ¼ and ⅜	52	34
½	64	50½	½	57	43
¾ to 1½	68	54½	¾ to 1½	61	45
2 to 3	69	55½			

Lap Weld, extra strong, plain ends

2	63	49½	1¼	50	33
2½ to 4	66	52½	1½	55	39
4½ to 6	65	51½	2	57	42
7 to 8	61	45½	2½ to 4	59	45
9 to 12	56	40½	4½ to 6	58	44
			7 to 8	52	38
			9 to 12	47	33

Butt Weld, double extra strong, plain ends

½	55	43½	¼	44	31
¾ to 1½	58	46½	¾ to 1½	47	34
2 to 2½	60	48½			

Lap Weld, double extra strong, plain ends

2	55	43½	1½	44	30
2½ to 4	57	45½	2	44	30
4½ to 6	56	44½	2½ to 4	46	35
7 to 8	51	35½	4½ to 6	45	34

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Sheets.—Makers' prices for mill shipments on sheets of U. S. standard gage, in carload and larger lots, are as follows, 30 days net, or 2 per cent discount in 10 days:

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	2.95 to 3.20
Nos. 9 and 10	3.00 to 3.25
Nos. 11 and 12	3.05 to 3.30
Nos. 13 and 14	3.10 to 3.35
Nos. 15 and 16	3.20 to 3.45

Box Annealed Sheets, Cold Rolled

Nos. 17 to 21	2.70 to 2.85
Nos. 22 and 24	2.75 to 2.90
Nos. 25 and 26	2.80 to 2.95
No. 27	2.85 to 3.00
No. 28	2.90 to 3.05
No. 29	2.95 to 3.10
No. 30	3.15 to 3.30

Galvanized Sheets of Black Sheet Gage

Nos. 10 and 11	3.15 to 3.25
No. 12	3.25 to 3.35
Nos. 13 and 14	3.25 to 3.35
Nos. 15 and 16	3.35 to 3.45
Nos. 17 to 21	3.50 to 3.60
Nos. 22 and 24	3.60 to 3.70
Nos. 25 and 26	3.75 to 3.85
No. 27	4.00 to 4.10
No. 28	4.15 to 4.25
No. 29	4.30 to 4.40

Boiler Tubes.—Discounts on less than carloads, freight to destination added, effective from April 15, 1916, are as follows:

Lap Welded Steel		*Standard Charcoal Iron*	
1½ in.	35	1½ in.	27
1¾ and 2 in.	47	1¾ and 2 in.	39
2¼ in.	44	2¼ in.	36
2½ and 2¾ in.	50	2½ and 2¾ in.	42
3 and 3¼ in.	55	3 and 3¼ in.	47
3½ to 4½ in.	56	3½ to 4½ in.	48
5 and 6 in.	49	5 and 6 in.	41
7 to 13 in.	46	7 to 13 in.	38

Locomotive and steamship special charcoal grades bring higher prices.

1¾ in., over 18 ft., and not exceeding 22 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Metal Markets

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York		Tin,	Lead		Spelter	
Aug.	Lake	Electro-lytic	New York	New York	St. Louis	New York	St. Louis
30	27.50	27.50	38.87½	6.50	6.50	9.00	8.75
31	27.50	27.50	38.75	6.50	6.50	8.87½	8.62½
Sept.							
1	27.75	27.75	38.75	6.50	6.50	8.75	8.50
2	28.00	28.00	....	6.50	6.50	8.75	8.50
4	....	....	....	....	....	....	....
5	28.00	28.00	38.87½	6.75	6.60	8.75	8.50

NEW YORK, Sept. 6, 1916.

Copper is stronger, with nearby metal scarce. Consumers of tin show but little interest and prices are lower. Lead has stiffened after buying by consumers short of stock supplies. Spelter is dull and lower. Antimony has declined in a quiet market.

New York

Copper.—Prior to the scare over the possibility of a railroad strike there was a good volume of buying. While this has temporarily subsided, the market is unquestionably strong. September electrolytic is quoted at 28c.; October, 27.75c.; November and December, 27.50c., and first quarter, 26.50c. Lake copper is nominally the same as electrolytic. The quotation for nearby metal is that of outside interests, the producers being sold up for the time. September copper is scarce, and an effort to obtain 300 tons of spot yesterday was unsuccessful. Foreign governments are expected to come in the market for huge quantities for 1917 delivery, but producers are not willing to book the business at the heavy concessions desired. It is said that England has offered 25c. to 25.50c., which was declined. The August exports total 32,160 tons. The London market yesterday for electrolytic was £130, against £129 a week previous.

Copper Averages.—The average price of Lake copper for the month of August, based on daily quotations in THE IRON AGE, was 26.95c., and for electrolytic, 26.72c.

Tin.—The only noteworthy activity has been in futures. Late on Aug. 31 about 250 tons was dealt in for future delivery, and on the following day 150 tons. Spot and nearby have been neglected and this despite offers of fairly low prices. The large consumers, and especially those in the interior, apparently see no reason for buying freely, the explanation of which is that they are now taking deliveries of tin bought at high prices and their frame of mind is not optimistic. Business has been hampered also by the railroad disturbance. The deliveries into consumption in August were smaller than was expected, but this did not depress the market in the slightest degree. They amounted to 4335 tons, which ordinarily would be considered good. The total of deliveries in eight months, 40,388 tons, is 8130 tons in excess of the same period last year. In stock and landing Aug. 31 was 4756 tons. Banca tin continues a factor, selling from 1c. to 1½c. per lb. under Straits. There is now afloat 3840 tons en route to this country. The quotation for spot Straits yesterday was 38.87½c.

Lead.—The market in this metal has been a shifting one. Last week there was but little change in the situation. When the leading interest sold at the price it has steadfastly quoted—6.50c., New York—it was in limited quantities and to regular customers only. Independent producers are well sold ahead for the most part and the situation enables some outsiders to get premiums. There are indications that some consumers stayed out of the market too long, with the result that they are now short of metal and are looking for prompt deliveries. There was inquiry of this sort yesterday and sales were made up to 6.75c., New York, and 6.65c., Chicago. More could have been sold if it had been available. Shipments three to four weeks away were $1 to $2 per ton cheaper. The St. Louis independent quotation yesterday was on a par with that of New York. The leading producer quotes 6.42½c., St. Louis. The August exports were light, amounting to only 830 tons.

Spelter.—Prompt can be had easily at 8.75c., New York, and 8.50c., St. Louis, and it is probable that these figures might be shaded. Some interest was shown by domestic consumers yesterday, but on the whole the market is quiet. Second hands are held responsible for a good bit of speculation in spelter. September delivery is held at 8.50c.; October, 8.25c.; November, 8.12½c., and December, 8c., all St. Louis. On Aug. 31 the New York Metal Exchange, following the recommendation of the spelter committee, adopted a new ruling as to what constitutes a good delivery on contracts for prime Western spelter. It reads that prime Western shall be virgin spelter resulting from the distillation of zinciferous material and shall not contain on the average in excess of 2 per cent lead and 0.08 per cent iron. The August exports were large, amounting to 11,352 tons.

Antimony.—In a dull market quotations have declined, and spot metal can be had at 12c. to 12.50c., duty paid, although some of the importers are holding their quotations considerably above these figures.

Aluminum.—The market is strong but without features of special interest, at 60c. to 62c. for No. 1 virgin aluminum, 98 to 99 per cent pure.

Old Metals.—Values are rising, with an active demand. All metals are higher. Dealers' selling prices are as follows:

	Cents per lb.
Copper, heavy and crucible	24.50 to 25.50
Copper, heavy and wire	23.25 to 24.00
Copper, light and bottoms	20.50 to 21.50
Brass, heavy	14.00 to 15.00
Brass, light	11.50 to 12.00
Heavy machine composition	19.00 to 19.50
No. 1 yellow rod brass turnings	14.25 to 15.00
No. 1 red brass or composition turnings	15.50 to 16.50
Lead, heavy	6.00
Lead, tea	5.50
Zinc	7.00 to 7.50

Chicago

SEPT. 2.—Prices of non-ferrous metals, while slightly easier, still reflect a firm producer situation. We quote: Casting copper, 26c.; Lake copper, 27.75c.; tin, carloads, 39.50c., and small lots, 41c.; lead, 6.65c. to 6.75c.; spelter, 8.50c.; sheet zinc, 15c.; Cookson's antimony, 50c.; other grades, 14.50c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 19.50c.; copper bottoms, 17.75c.; copper clips, 18.50c.; red brass, 17c.; yellow brass, 13c.; lead pipe, 5.25c.; zinc, 6c.; pewter, No. 1, 28c.; tinfoil, 33c.; block tin pipe, 37c.

St. Louis

SEPT. 4.—Non-ferrous metals have been firm the past week, with these prices quoted at the close: Lead, 6.65c. to 6.75c.; spelter, 8.75c.; tin, 39.50c. to 40c.; Lake copper, 28c. to 28.50c.; electrolytic copper, 27.50c. to 28c.; antimony, 15c. for Asiatic metal. In the Joplin ore district there was a further curtailment of production, with zinc blende quoted at $50 to $70, premium settlements of choice ores running as high as $73, and the average for the week $61.50 per ton. Calamine ranged from $35 to $45, with the average for the week $42. Lead ore was firm at $65 for 80 per cent, and the average for the week $64. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 8c.; heavy yellow brass, 11c.; heavy red brass and light copper, 15c.; heavy copper and copper wire, 17c.; pewter, 25c.; tinfoil, 30c.; zinc, 5c.; lead, 5c.; tea lead, 3.50c.

German Pig Iron and the Manganese Supply

Complaints of the present quality of German pig iron are found in a Dutch periodical, which states that it is daily proving worse, and the opinion is advanced that this deterioration is due to a shortage of skilled workmen and an insufficient quantity of manganese. The substitute for manganese, reported in German papers, does not seem to have come up to expectations, continues the report, and the iron is hard and brittle.

Pittsburgh and Nearby Districts

The Pennsylvania Lines West, through its purchasing agent at Pittsburgh, has sent out inquiries for about 50 machine tools, including two 100-in. boring mills, two 6-ft. radial drill presses, one 600-ton 90-in. driving wheel press, one 60-ton vertical driving box and rod press, about 15 16 to 60-in. lathes, two forging machines, three high-power turret lathes, one cold saw, one guide-bar grinding machine, three planers, several heavy-duty drill presses, four or five small boring mills, two rod-boring machines, one traverse head shaper, one 24-in. horizontal boring and drilling machine, and a number of pneumatic tools.

The H. Koppers Company, Pittsburgh, is inquiring for 12 machine tools for shop equipment, to be used at the by-product coke plant of the Seaboard By-Product Coke Company, now being erected near Jersey City, N. J.

The Pittsburgh Steel Company reports sales for the twelve months ended June 30, 1916, as $21,848,035.67, compared with $11,649,863.97 for the year ended June 30, 1915. Net profits were $4,564,067.18, compared with $858,160.02 for the previous year. There was set aside out of the earnings for the year ended June 30, 1916, the sum of $500,000 as a reserve for depreciation. The company has issued a call for payment on Oct. 1 of $1,000,000 of its 6 per cent coupon gold notes, series C, due Jan. 1, 1920. These are the last of that series of notes, and the last of the entire issue of $5,000,000 of notes dated Jan. 1, 1915, and which were to mature as follows: $1,500,000, Jan. 1, 1918; $1,500,000, Jan. 1, 1919; $2,000,000, Jan. 1, 1920.

The Standard Stamping Company, Marysville, Ohio, maker of hardware specialties and stamped-metal goods, has increased its capital from $70,000 to $120,000. The company states that the increase was made on account of its rapidly growing business, and that it is probable some new building operations will be necessary later on.

The Standard Seamless Tube Company, Pittsburgh, has started up its open-hearth steel plant at Economy, Pa., which contains two 30-ton open-hearth furnaces. At present the company is turning out ingots which are being sold in the open market, but about October, when the company expects to finish and put in operation its new seamless-tube mills, it will use its entire output of steel.

The Sharpsville Boiler Works Company, recently organized at Sharpsville, Pa., with a capital of $50,000, has elected officers as follows: Hugh J. Garvey, president; Charles D. Fagan, secretary; F. W. King, treasurer; James P. Keene, general manager; and W. C. McGaffic, superintendent. The company states that it has orders on its books to keep it busy for the next eight months. It is about to erect an additional building, 70 x 120 ft., of steel construction.

The Baldwin Tool Works Company, Parkersburg, W. Va., has completed an addition to its plant that will be occupied at an early date.

The city of Upper Sandusky, Ohio, has awarded a contract for a new filter control apparatus with the Pittsburgh Filter Mfg. Company, Pittsburgh.

The Johnson Bronze Company, New Castle, Pa., has placed a contract with the Anderson Construction Company for the erection of a new foundry to cost about $85,000. It will be of steel and brick construction, and will be equipped with the most modern appliances.

The Brier Hill Steel Company, Youngstown, Ohio, which is building two 100-ton open-hearth furnaces, expects to have one finished about Dec. 1 and the other about Jan. 1. The company now has 10 open-hearth furnaces of this capacity, making about 15,000 tons of steel per month.

The creditors' committee appointed some time ago to handle the financial affairs of J. V. Thompson, coal and coke operator, Uniontown, Pa., announces a program which it is submitting for the creditors' approval. This gives the committee a period of three years from Sept. 1, in which to adjust the Thompson finances. The committee states that it represents and is acting for over 98 per cent of the unsecured creditors under terms of a deposit agreement. James A. Campbell, president Youngstown Sheet & Tube Company, and Julian Kennedy, Pittsburgh, are members of the committee.

The Blairsville Machine Company, Blairsville, Pa., with a capital stock of $5,000, has been incorporated by J. R. Robinson, Mount Lebanon, Pa.; L. H. Seidner, 49 Bryant Avenue, Bellevue, Pa., and M. R. and P. W. Robinson, Blairsville, to manufacture fans, ice machines, etc.

The Wilson & Daum Company, Pittsburgh, with a capital stock of $50,000, has been incorporated by Rowland S. Wilson, 341 South Rebecca Street, Pittsburgh; John A. Daum and Rowland S. Wilson, Jr., to manufacture lighting fixtures, etc.

It is practically confirmed that the Westinghouse Machine Company, East Pittsburgh, will build a large plant at Essington, near Philadelphia, on ground acquired some months ago. It will make the same products as are at present made at East Pittsburgh, but probably some time will elapse before definite plans have been worked out. The company is inquiring for 6000 tons of structural material for steel buildings for the new plant.

Stockholders of the recently organized Edgewater Steel Company, which will take over the plant and assets of the Kennedy-Stroh Corporation, Oakmont, Pa., near Pittsburgh, held a meeting in the latter city on Wednesday, Sept. 6, to elect officers and also to take steps to dissolve formally the Kennedy-Stroh Corporation. The Edgewater Steel Company, it is understood, will manufacture steel tires and forged steel carwheels. Some open-hearth furnaces and other equipment will be added to the plant at Oakmont. Some time ago the corporation sold its entire pipe-fitting department to the Pittsburgh Valve, Foundry & Construction Company.

Changes at American & British Mfg. Company

Control of the American & British Mfg. Company, Bridgeport, Conn., has changed hands. This has caused the retirement of Joseph H. Hoadley, president; A. H. Hoadley, general manager; William E. White, treasurer, and William M. Strawn, superintendent. John C. Stanley, who has been made president, retains his connection as purchasing agent of the Remington Arms-Union Metallic Company ammunition plant. Suit has been brought against Joseph H. Hoadley and the Cramp-Hoadley Company, which in the complaint is termed the "alter ego" of Mr. Hoadley, to restrain them from disposing of five notes of the American & British Mfg. Company amounting to about $200,000 and of other securities of the company. The suit is brought against Joseph H. Hoadley, the Cramp-Hoadley Company, Alfred H. Hoadley, George E. Bouchie and William E. White, directors of the Hoadley Company, to recover assets which it is alleged have been diverted. The election of Mr. Stanley to the presidency is taken to mean that the Remington interests are now in control of the American & British Company, which is a large producer of heavy guns and munitions.

Increasing Its Tungsten and Alloy Plant

The Hudson Reduction Company, 314 Empire Building, Pittsburgh, with works at Latrobe, Pa., has greatly increased its capacity, and is operating 33 electric smelting furnaces in the manufacture of ferrotungsten and tungsten metal. Additions are under way to produce ferrosilicon and ferrovanadium. Branch offices are located at 50 Church Street, New York, and Commercial Trust Building, Philadelphia.

The Cleveland Crane & Engineering Company, Wickliffe, Ohio, which is engaged in the manufacture of shell forgings in addition to its regular line, has taken an additional contract for forging 100,000 4½-in. shells for England. The machine work on these shells will be done in Canada.

PERSONAL

B. R. Shover, former general superintendent of the Tata Iron & Steel Company, Ltd., Sakchi, India, who resigned recently, returned to his home in Youngstown, Ohio, last week. He states that 9 cents a day in our money is paid for common labor in the Tata works, but about six men are required to do the work that one does in this country. The company is now employing close to 9000 men, of whom about 160 are white men. It is now turning out about 10,000 tons of steel per month, of which about 20 per cent is munition steel and the remainder merchant steel bars, plates and shapes.

Walter F. Schleiter of Dilworth, Porter & Co., Inc., Pittsburgh, maker of spikes and tie-plates, has been elected a director of H. P. Taylor & Co., dealers in stocks and bonds in that city.

William J. S. Ritscher, formerly assistant to L. F. Hamilton, manager of the publication department of the National Tube Company, Pittsburgh, has resigned to become advertising manager of the Petroleum Iron Works Company, Sharon, Pa.

Arthur L. Lewis, formerly with L. F. Fales, Walpole, Mass., has been appointed superintendent of Sleeper & Hartley, Inc., Worcester, Mass.

P. J. Freeman has resigned from the professorship of applied mechanics in Kansas State College to become engineer of tests for the Pittsburgh Testing Laboratory.

Ferdinand Jehle has resigned as laboratory engineer with the Automobile Club of America to become service engineer with the Aluminum Castings Company, Cleveland.

W. H. Kavanaugh, for 15 years a member of the faculty of the College of Engineering at the University of Minnesota, has accepted the professorship of experimental engineering in the Towne Scientific School of the University of Pennsylvania.

R. D. Day, formerly with the William Tod Company, Youngstown, Ohio, has been appointed assistant to Vice-President Maurice Pollak of the Pollak Steel Company, Cincinnati, Ohio.

A. W. Foote, president Foote-Burt Company, Cleveland, builder of drilling machinery, has been elected president of the H. A. Lozier Company, automobile manufacturer, Cleveland, succeeding H. A. Lozier, who continues as director.

S. R. Willock, who has been assistant sales manager, has been appointed general manager of sales of the William Tod Company, Youngstown, Ohio. He succeeds R. D. Day, who has resigned to become connected with the Pollak Steel Company, Cincinnati.

Frank L. Herzog, chief engineer for the Philadelphia Roll & Machine Company, Philadelphia, has resigned to take a position with Mackintosh, Hemphill & Co., Pittsburgh. Leonard F. Uthe is leaving the Garrett-Cromwell Engineering Company, Cleveland, to take the position vacated by Mr. Herzog.

The Universal Portland Cement Company, Chicago, announces the following appointments: Adolph G. Carlson, mechanical engineer since 1907 and formerly assistant superintendent of the Syracuse, Ind., plant of the Sandusky Portland Cement Company, is appointed chief engineer. He has had to do with the designing of Nos. 3, 4 and 6 mills of the Universal Portland Cement Company at Buffington, Ind., and No. 5 mill at Pittsburgh and No. 7 mill at Duluth. M. S. Humphryes, formerly superintendent of No. 6 mill, Buffington, Ind., is appointed assistant mechanical engineer at the general offices in Chicago. Nels Nelson, formerly superintendent of No. 2 mill, South Chicago, which plant has been dismantled, is appointed superintendent of No. 6 mill, Buffington, Ind. J. H. Lendi is appointed electrical engineer at the general offices in Chicago. He has been connected with the company for several years in the engineering department. A. C. Wilby is appointed assistant to the president, having been assigned to these duties in April, 1915, after seven years' connection with the sales department of the company, first as salesman and then as division sales manager.

Bertholf M. Pettit, for three years advertising manager of the J. I. Case Threshing Machine Company, Racine, Wis., has resigned to accept a position with the Curtis Publishing Company, Philadelphia.

Arthur J. Sweet of Vaughn, Meyer & Sweet, Majestic Building, Milwaukee, consulting engineers and electrical experts, has withdrawn from the partnership and established an office in the Palace Theater Building, Milwaukee, for the general practice of electrical and consulting engineering.

B. L. Worden, Buffalo, N. Y., president Worden-Allen Company, structural fabricator and erector, Milwaukee, Chicago and Buffalo, together with the managers of the branch and home offices, spent last week in a tour of the Michigan copper country to inspect the large number of mining structures the company has erected in that section.

Charles Schuering, for many years in charge of the Lyons Boiler Works, De Pere, Wis., has accepted the position of superintendent of the Weil Boiler Company, Indianapolis, Ind., and assumed his new duties Sept. 1.

Albert H. Noyes, who has been assistant secretary and treasurer of the Ayer & Lord Tie Company, Chicago, has been appointed secretary and treasurer.

James Donald, of Leopold Walford, Ltd., London, England, and some years ago identified with the New York Shipbuilding Company, has established an American branch of the Walford institution at 17 Battery Place, New York, known as the States Marine & Commercial Company, Inc., to conduct an exporting business in coal and steel products, as well as in general steamship freight contracting. He is general manager of the company, which will also have connections with other branches of the Walford house, such as the Compagnie Française de Marine et de Commerce, Paris, and the Kenitra Commercial Company, Ltd., Kenitra, Morocco.

George S. Thompson, formerly with Gaston, Williams & Wigmore, Inc., is now in charge of an office at 8 Rue Edouard VII, which the American Steel Export Company, Woolworth Building, New York, has established at Paris, France.

New Method of Producing Copper Coated Steel

A process for uniting bodies of dissimilar metals is covered by a patent (U. S. No. 1,193,667) issued to Fred B. Corey, Barberton, Ohio. The union between the metals is effected by welding and is relied upon to resist the action of mechanical stresses produced in working the metal, as well as changes in temperature. In producing bimetallic shapes one of the metals has its surface thoroughly cleaned. A thin layer of a metal having a low melting point is then welded to the cleaned surface and any excess metal is removed. The surface of the other metal, which has been thoroughly cleaned, is then brought into intimate contact with this coating and the whole heated to a temperature at which an alloy is formed between the metal having a low melting point and the one which it is desired to unite to it. The temperature at which this alloying action takes place, of course, is below the melting point of either of the two metals that it is desired to join. The object of this method is to produce a union that will avoid absorption of one of the metals by the other and also give a metallic structure that may be rolled, drawn, hammered, bent, twisted, punched or machined without destroying the union between the two metals.

The selection of Cleveland as a site for new automobile industries is noteworthy. The movement began with the Chandler Motor Car Company. It was followed by the H. A. Lozier Company, the Jordan Motor Car Company, and the Grant Motor Car Corporation, and more recently the Consolidated Car Company.

STRIKES AND SETTLEMENTS

More New England Labor Troubles

As predicted last week, a strike involving a large number of workmen took place Saturday, Sept. 2, at the Pittsfield, Mass., shops of the General Electric Company. The company has issued a statement in which it says that, of the 6300 workmen, but 1869 walked out, many of the union members refusing to leave the plant. The labor leaders claim that over 4000 are out, including many unorganized workmen, who struck in sympathy. The main issues are an advance of 10 per cent in pay, reinstatement of men discharged (presumably for organization activities), discrimination against men seeking work who acknowledge that they are union members and recognition of shop committees. It is claimed that the strikers do not seek direct recognition of the unions at this time. The plant was to be reopened Tuesday morning.

Following the strike over a week ago in the A. H. Wells & Son division of the Greenfield Tap & Die Corporation, Greenfield, Mass., 175 men out of 376 at the Wiley & Russell division walked out last Wednesday. It is expected that trouble will occur in another division within a day or two. The shops are now running 54 hr. a week and the demands are, as usual, for an 8-hr. day and time and one-half for over hours, with double time for Sundays and holidays. F. H. Payne, secretary of the corporation, states that the trouble in the A. H. Wells & Son plant is practically over and that the company has no intention of granting any of the demands, as the movement is really an effort to unionize the plants, the men being already among the highest paid in Massachusetts factories, having had several raises of pay in the past year.

The labor troubles in New Haven are practically over, as the Winchester Repeating Arms, Geometric Tool, Peck Bros. Company and Eastern Machine Screw plants are fast resuming normal conditions. The manufacturers are steadfast in their refusal to accede to any of the demands made upon them.

While conditions are not greatly changed in the molders' strike in Bridgeport, Conn., three or four of the foundries are resuming operations with workmen secured mostly from outside of the city and the prospect of the strikers winning is growing faint. The entire membership, including the founders, of the Bridgeport Manufacturers' Association is a unit in its determination to keep Bridgeport an open shop city.

The Dayton Strike

Reports date Sept. 1 from Dayton, Ohio, show that a total of 973 machinists have struck and that 282 of them have returned to work, leaving only 691 men that are still out. It is stated that most of these are men recently employed and many of them are not finished mechanics. The plant that was most affected has succeeded in getting a sufficient number of men to operate on full time.

Nashville Machinists May Strike

Sixty members of the local machinists' union at Nashville, Tenn., at a meeting Aug. 28, pledged the organization to the policy of an 8-hr. day in the machine shops of Nashville and set about fuller organization of the trade in the city. Various representatives of the international organization were present and urged the men to demand the shorter working day with the present wage scale. A strike may result.

Two Blast Furnaces for Ford Tractor Company

The Ford Motor Company, Detroit, through its identified interest, the Ford Tractor Company, has about completed plans for the building of two blast furnaces in the Detroit district to make foundry iron. The plans of the Ford Tractor Company, as heretofore noted, contemplate a large plant for the building of tractors, but these have not been completed. The two blast furnaces will have a combined daily capacity of about 800 tons. Julian Kennedy, Pittsburgh, is consulting engineer for this new project.

OBITUARY

HENRY B. DENKER, one of the principal founders of the St. Charles Car Company, now a part of the American Car & Foundry Company, died at St. Charles, Mo., Aug. 30, aged 77 years. He was a native of Germany, whence he came when but 19 years of age, settling in St. Charles. He served in the Union army as captain during the Civil War, and then assisted in establishing the car plant which afterward was merged with the larger concern. After the merger he was made district manager. He served as mayor of his city for several terms. He leaves three daughters and two sons.

ALBERT BOEBINGER, president Boebinger Hardware Company, Cincinnati, Ohio, a hardware and mill supply house, was killed by an automobile when crossing the street, Sept. 1. He was a prominent member of the Ohio Hardware Association, having been chairman of its exhibit committee for eight years, and was vice-president of both the Cincinnati Hardware Guild and of the Hardware Club of Cincinnati. He was 52 years old and leaves his widow and a daughter.

S. S. LEONARD, vice-president and manager Western Automatic Machine Screw Company, Elyria, Ohio, died Sept. 3 from hardening of the arteries, aged 62 years. He went to Elyria in 1906 from Cleveland, where he had been engaged for many years in manufacturing lines. He was vice-president of the Elyria Young Men's Christian Association and ex-president of the Elyria Chamber of Commerce.

WILLIAM FERGUSON, president Ferguson & Lange Foundry Company, Chicago, died suddenly in the night of Aug. 29 from an apoplectic stroke, aged 63 years. He had been active at the foundry that day and had attended the theater in the evening. He had been associated with H. O. Lange for the past 17 years. He leaves his widow and five children.

JAMES M. DENNISTON, for many years general traveling salesman of the American Steel & Wire Company, died at his residence in the Chicago Athletic Association, Aug. 29. He was born in Pittsburgh in 1866. Mr. Denniston was well known in wire circles in Pittsburgh and the West.

DAVID C. FARRAR, of the Farrar Advertising Company, Empire Building, Pittsburgh, died at his home in that city Aug. 31. The company handles the advertising accounts of a number of the leading manufacturing concerns in the Pittsburgh district.

ALBERT F. ROBER, president Rober Machinery Company, Portland, Ore., died Aug. 22, aged 53 years.

WILLIAM BUNTING, president Bunting Brass & Bronze Company, Toledo, Ohio, died Aug. 26.

Foundry Exhibition Opens Sept. 12

C. E. Hoyt, manager of the department of exhibits, American Foundrymen's Association, announces that the opening of the exhibition at Cleveland in connection with the foundrymen's convention has been postponed from 2 p. m., Monday, Sept. 11, to 9 a. m., Tuesday, Sept. 12. Some exhibitors, because of the embargoes announced by the railroads in anticipation of a possible strike, were unable to make shipment until Sept. 5. That all exhibits arriving at Cleveland on Monday, Sept. 11, may be installed before the opening, the postponement has been ordered.

A recent statement from China is that less than a year ago the Shanghai-Hangchow-Ningpo Railway placed an order with the United States Steel Products Company for four bridges to be fabricated at Ambridge, Pa. The completion of these bridges on schedule time, notwithstanding difficulties brought about by the war, has been gratifying, for they were shipped to China and erected within eleven months after the order was cabled to the United States. The accuracy with which all the parts fitted when assembled is a matter of comment.

Machinery Markets and News of the Works

LARGE RAILROAD LIST OUT

Inquiry from Pennsylvania Lines West

August Business, Helped by War Demand for Large Lathes, Above Normal—Threatened Strike Did but Little Harm

The Pennsylvania Lines West is in the market for about 50 machine tools, and from other directions come indications of interest on the part of railroads, although in the East they are slow in closing.

August business was above normal, and the tool builders almost without exception have orders enough to keep their capacity engaged for some time. Here and there a maker is pretty well caught up. Large lathes are difficult to obtain for prompt shipment, but the new demand for them has passed. The buying of such machines early in August considerably swelled the month's business. Altogether, however, all types of machines shared the demand. The month brought an excellent volume of orders from the manufacturing trades.

In Cleveland the general demand was good, although some hesitancy in closing was noted. In Cincinnati there is a dearth of large engine lathes. August activity in Milwaukee was satisfactory. In that city, new construction showed a falling off when compared with August a year ago, but the year is ahead of the same period in 1915 by 35 per cent.

In the Pacific Northwest machine-tool dealers are interested in contemplated improvements at the Puget Sound Navy Yard, Port Townsend, Wash. The demand from the Orient for machinery is excellent.

The French Commission continues to place orders in New York, but the Russians are less active, partly because the port of Archangel will be closed before steamers from New York can arrive there.

The threatened railroad strike exercised a short-lived influence on the trade. In some cases shipments were deferred for two or three days because the railroads refused to assume any risks.

New York

NEW YORK, September 6, 1916.

The aggregate of business in August was above normal in volume, although the pressure was less than in previous months. All types of tools shared the demand. In the latter part of the month no large lists were issued, but scattered, miscellaneous sales were excellent. Business was greatly augmented early in the month by the companies who had booked orders for 6 to 12-in. shells. The feeling of the trade is that the passing of Labor Day will bring more activity.

The threatened railroad strike made itself felt to a limited extent by the action of the railroads in refusing to accept shipments except at the shippers' risk, causing some of the latter to defer shipments pending developments. In most cases only two or three days' delay resulted.

Prices continue strong, with some of the builders reserving the right to advance prices at the time of delivery should conditions warrant, but most of the makers name a flat price in their contracts to which they will adhere. Deliveries are growing better, even those of good standard tools.

A few of the railroads have inquiries out for tools, but they are slow in closing. The General Electric Company continues to buy for delivery to Schenectady, N. Y. and Fort Wayne, Ind.

The Tide Water Oil Company, 11 Broadway, is inquiring for the following tools, new or second hand:

One 20-in. x 6-ft. lathe, one 20-in. Gisholt turret lathe, one 60-in. boring mill, one 40-in. drill press, and one 2¼-in. Acme screw machine.

The French Commission continues to place orders, having taken some boring mills, among other machines. The Russians are not buying as actively as they were a few weeks ago, when shipments could be made by way of Archangel, but they are in the market occasionally for tools to be forwarded via Vladivostock. The carefulness and good judgment shown by most of the foreign buyers is a subject of remark.

The American Car & Foundry Company has been in the market, it is reported, for equipment to fill a contract for 300,000 shells for the United States Government.

The Pennsylvania Lines West, through its purchasing agent at Pittsburgh, has sent out inquiries for about 50 machine tools, including two 100-in. boring mills, two 6-ft. radial drill presses, one 600 ton, 90-in. driving wheel press, one 60-ton vertical driving box and rod press, about 15 16 to 60-in. lathes, two forging, three highpower turret lathes, one cold saw, one guide bar grinding machine, three planers, several heavy duty drill presses, four or five small boring mills, two rod-boring machines, one traverse head shaper, one 24-in. horizontal boring and drilling machine and a number of pneumatic tools.

Scott & Williams Laconia, N. Y., manufacturers of knitting machines, are adding three stories to their present plant.

The Lewiston & Lake Ontario Shore Power Company, Ransomville, N. Y., has been granted a franchise for the construction and operation of an electric lighting system, and will erect a power plant.

The Union Springs Light & Power Company, Union Springs, N. Y., has completed plans for extensions and improvements to be made at its power plant.

The Lehigh Valley Railroad Company has completed plans and will soon let contracts for the erection of shop buildings at Manchester N. Y.

The Sherman Carbureter Company, Inc., Buffalo, has been organized to manufacture carbureters and automobile and motor cycle supplies. W. H. Grever, 146 Hughes Avenue, R. C. Harrison and J. F. Sherman, Buffalo, are the incorporators.

The Automatic Transportation Company, Buffalo, is building a two-story concrete addition to its plant at Main Street and the Erie Railroad. Other extensions and additions to be made at a later date are in contemplation.

The Higrade Motors Company, Buffalo, N. Y., has been incorporated with a capital stock of $250,000 and will manufacture a medium size motor truck, weighing about 2200 lb. The incorporators are J. Elmer Pratt, 67 Beard Avenue, Buffalo, formerly sales manager of the Pierce-Arrow Motor Car Company; L. W. Coppock, Grand Rapids, Mich., and William J. Loomis, Ionia, Mich. Arrangements are being completed for the establishment and equipment of a plant at Grand Rapids, Mich.

The MacLaren Knitting Company, West Sand Lake, N. Y., is in the market for a second-hand 750-gal. underwriters' steam fire pump.

The United Wax Paper Mfg. Company, Buffalo, has been incorporated with a capital stock of $25,000 by John E. Willis, 216 Pearl Street; Henry J. Walz and Roswell S. Price. A factory will be located at Buffalo, or Orchard Park.

The H. D. Pancoast Company, Philadelphia, is taking revised bids on a machine shop, office building and storage shed to cost $20,000.

P. J. Collins, 1301 North Second Street, Philadelphia, will erect a one-story machine shop 108 ft. long. The architect is now taking bids.

The Yost Brothers Company, Creighton, Pa., contemplates the erection of a one-story machine shop and foundry addition, 50 x 100 ft., to cost $20,000. W. F. Yost is president.

The Light Railway Equipment Company, Chester, Pa., will build a one-story addition, 60 x 75 ft.

New England

BOSTON, MASS., Sept. 4, 1916.

The Heald Machine Company, Worcester, Mass., has awarded a contract for an addition, 120 x 190 ft., one story, to its recently completed machine shop. The new section will not require the immediate purchase of machinery, as it will be devoted to expansion of the present machine tool layout and to storage.

The Frank Mossberg Company, Attleboro, Mass., is to build two additions, 150 x 200 ft., and 80 x 120 ft., one story.

Napoleon R. Thibert, 3 Heard Street, Worcester, Mass., is equipping a shop to manufacture munitions which will employ about 22 men. It is reported that he has secured a munitions contract totaling $165,000 from the General Electric Company.

The main building of the Wollaston Foundry Company, Quincy, Mass., has been destroyed by fire.

The Clark Brothers Bolt Company, Southington, Conn., has increased its capital stock from $250,000 to $400,000.

The Electric Systems Corporation, Providence, R. I., has been incorporated with a capital stock of $100,000, to manufacture and deal in electric appliances. The incorporators are Harry W. Mays, Arthur C. Stone, George Briggs, Jr., and Alton E. Stevens, all of Providence.

A. O. Norton, Boston, Mass., manufacturer of lifting jacks, has bought land on Brookline Avenue on which he contemplates erecting a factory.

The Derby Mfg. Company, Derby, Conn., has been incorporated with a capital stock of $300,000, by Joseph Willman, Frank M. Clark and Charles N. Downes, to manufacture steel and iron goods.

The Bosch Magneto Company, Springfield, Mass., has awarded a contract for a factory addition to cost $200,000.

George A. Leighton, president Leighton Machine Company, Manchester, N. H., is to build an iron foundry on Silver and Maple streets which, it is reported, is to be leased to a Maine company.

The Hunt-Spiller Corporation, Boston, Mass., has awarded a contract for an addition, 50 x 70 ft., one and two stories, to its foundry at 383 Dorchester Avenue.

The Feeney Tool Company, Bridgeport, Conn., has been incorporated with a capital stock of $40,000. The directors are John M. Feeney, president and treasurer; John McD. Cronin, secretary; John D. Lockhart and D. J. Slavin.

The United Wire & Supply Company, Auburn, R. I., is to concentrate the business of the company, now carried on in plants in Pawtucket and Auburn, in a new factory, 200 x 340 ft. with two wings, now being erected on a six-acre plot in Auburn.

The Texas Steamship Company, Bath, Me., has $3,500,000 worth of work now under way in its recently acquired shipyard, including four large steamers with a total tonnage of more than 25,000, two harbor steamers and a tug.

The Fox Auto Searchlight Company, Providence, R. I., has been incorporated with a capital stock of $100,000, by Joseph P. Fox, Walter H. Barney and Philip V. Marcus.

H. C. Dodge, Inc., Boston, Mass., manufacturer of machinery, machine tools, etc., is a new corporation with a capital stock of $50,000. The directors are Harry C. Dodge, president; Herbert A. Horgan, 79 Shirley Avenue, Revere, treasurer, and A. W. Blakemore.

The Scovill Mfg. Company, Waterbury, Conn., which is now building about 100 houses for employees, has bought about 45 acres of land off Hamilton Avenue, which it is expected to develop in the same manner.

The National Scale Company was erroneously stated in THE IRON AGE of August 25 to be located in Holyoke, Mass. The company is in Chicopee Falls, Mass., where it manufactures counting and weighing machines, elevating trucks, steel shelving and metal stampings.

Baltimore

BALTIMORE, MD., Sept. 4, 1916.

The Spanish-American Cork & Specialty Company, 2211 Pennsylvania Avenue, Baltimore, has acquired three lots at Westport, Md. Jose Aquilera is secretary-treasurer.

The Sapero Box Company, 220 Grindall Street, Baltimore, will install 100 hp. in motors for the manufacture of boxes.

The Harvey Company, 113 South Street, Baltimore, is seeking prices on steam shovels.

Plans are being made by the York Mfg. Company, West Point, Va., manufacturer of panels, to increase its output.

The Federal Extract Company has been formed at Bristol, Va., and plans are being made for the construction of a plant for the manufacture of wood extracts.

The mill of the Stuarts Draft Milling Company, Stuarts Draft, Va., was recently destroyed by fire, but will be rebuilt.

The name of the Rittenhouse Machine Company, Inc., 414 Key Highway, Baltimore, engineer and machinist, has been changed to the Key Machine Company.

The Duryea Motors Company, Inc., Philadelphia, is seeking a site for a plant in or near Baltimore. A letter has been received from Charles E. Johnson, treasurer, by Mayor James H. Preston asking the latter to hold a conference with Charles E. Duryea.

A garage containing a machine shop will be built at Brinckle and Pennsylvania avenues, Wilmington, Del., for Pierre S. DuPont.

Indianapolis

INDIANAPOLIS, IND., Sept. 4, 1916.

The Hoosier Wheel Company, Indianapolis, has been organized to manufacture farm machinery. The directors are Frank White, W. E. Osborn and W. Bert Denison.

The Wriley Mfg. & Distributing Company, Indianapolis, has been incorporated, with $10,000 capital stock, to manufacture toilet articles. The directors are J. R. Grotendick, J. H. Kehl and T. W. Smith.

The Wing Motor Car Company, Gary, Ind., has been incorporated, with $10,000 capital stock, to manufacture automobiles. The directors are Joseph Fluxman, A. A. Feder and William Feder.

The Kent Light & Power Company, Hanover, Ind., has been incorporated to operate an electric light plant. The directors are James C. Reed, P. Sample and I. A. Reed.

The Imperial Electrical Company, Union City, Ind., has increased its capital stock from $1,000 to $25,000.

The A. C. Mannweiler Company, Fort Wayne, Ind., has been incorporated, with $25,000 capital stock, to manufacture electrical supplies. The directors are A. C. Mannweiler, P. W. Mannweiler and Ellsworth Hartmann.

The Foster Machine Company, Elkhart, Ind., has increased its capital stock from $150,000 to $500,000.

The Logansport Machine Company, Logansport, Ind., has increased its capital stock from $6,000 to $25,000.

The plant of the Central Foundry Company, Fort Wayne, Ind., was damaged by fire. The estimated loss is about $1,500.

The Lexington-Howard Motor Company, Connersville, Ind., will build a one-story addition to its plant, 125 x 200 ft.

Robert H. Hassler, manufacturer of shock absorbers, Indianapolis, Ind., will erect a factory, 100 x 300 ft., to cost $45,000.

Scottsburg, Ind., is planning the establishment of a municipal water system at a cost of $21,000.

Chicago

CHICAGO, ILL., Sept. 4, 1916.

The period of buying heavy tools which attended the recent placing of contracts for shells of large size appears to have passed though an occasional inquiry is reported. The month of August, however, brought out a bigger volume of orders from the regular manufacturing trade than local dealers have received in any other month for a long time. Business has also been enhanced by railroad purchases of a miscellaneous sort, which, despite the absence of any formal lists of size, has aggregated a profitable and satisfactory total. The Pennsylvania lines have been buying a number of tools. Automobile manufacturers have been consistent buyers both of standard and special tools, one company offering to contract for the entire capacity of a Western tool builder for the manufacture of special tools.

Foreign sales of machinery for uses other than the manufacture of munitions are surprisingly heavy and in many instances of interesting origin. Builders of mining machinery are sending abroad almost record-breaking shipments as a result of the efforts of Great Britain and Russia to increase their gold supply by the forced operation of gold mines. Shipyards of Europe are also large buyers from Western builders and dealers.

The Wheeling Corrugating Company, Chicago, will build a garage at an estimated cost of $50,000, which is to be fully equipped for the maintenance of large trucks.

Oscar Baun, Thirty-first Street and Kedzie Avenue, Chicago, will build a one-story foundry, 40 x 200 ft., at an estimated cost of $10,000, exclusive of equipment.

The Centaur Motor Company, 2246 South Michigan Avenue, Chicago, will build a garage, 80 x 150 ft. to cost $60,000.

The Chicago, West Pullman & Southern Railroad, 606 South Michigan Avenue, Chicago, is about to build a one-story roundhouse and shops at a cost of about $20,000. W. D. Price is engineer.

The Albaugh-Dover Company, Chicago, has completed plans for a plant at Norfolk, Neb., for the manufacture of tractor engines.

The Allen Portable Hoister Company, Madill, Okla., has been organized with a capital of $5,000 by R. M. Harris, W. P. Allen and C. H. Brown.

The Sanitary Spray Company, St. Peter, Minn., has plans for the construction of a factory, 60 x 150 ft., to cost approximately $15,000.

Milwaukee

MILWAUKEE, WIS., Sept. 4, 1916.

The August machine-tool business in this district, while somewhat less in volume than that of the same month last year, is considered eminently satisfactory and figures considerably above the normal. The capacity of every tool builder is well taken up for a long time ahead, and the steady stream of orders during the last 60 to 90 days is continuing. The labor situation is still a perplexing problem, although the effects of the machinists' strike for an 8-hr. day have been greatly minimized. New construction during August shows a falling off, compared with a year ago, but the total for the year to this date is still 35 per cent larger than for the corresponding period of 1915. Much activity in public utility lines is noted, requiring a variety of equipment. The automobile, motor truck and gas engine industries are experiencing their most prosperous period. Gasoline engine builders, especially those catering to the automobile truck and tractor trade, are far behind on orders. The fall and winter are expected to be unusually heavy for the farm implement industry generally.

The American Show Print Company, 382-388 Sixth Street, Milwaukee, which sustained heavy damage by fire several weeks ago, will rebuild at once and add an additional story, 80 x 150 ft. Much new printing and electric motor equipment will be installed. Herman Pfeil is manager.

The Allis-Chalmers Mfg. Company, Milwaukee, has tentative plans by Klug & Smith, consulting engineers for an addition to the boiler shop and boiler material warehouse, 50 x 350 ft. No decision has been made as to when the work will be undertaken.

The Falls Machinery Company, Sheboygan, Wis., will erect two factory buildings, 120 x 120 and 82 x 85 ft., to cost approximately $60,000. Alfred C. Clas, Colby Abbott Building, Milwaukee, is the architect.

The Briggs & Stratton Company, Milwaukee, Wis., manufacturer of automobile specialties, will build a factory 60 x 220 ft., to cost $100,000.

R. R. Kastner, Mauston, Wis., will erect a two-story concrete building, 80 x 200 ft., to contain a machine shop, smithy, salesroom, farm implement warehouse and service station. The contract is in charge of Pratt Brothers.

The Waukesha Motor Company, Waukesha, Wis., is preparing to build a new brick and concrete administration building, 36 x 132 ft. two-stories and basement. The architect is H. C. Hengels, 1225 First National Bank Building, Milwaukee.

The Best Register Company, Fifteenth and Oklahoma avenues, Milwaukee, manufacturer of ventilators and registers for hot air heating systems, has changed its name to Metal Stamping & Mfg. Company. The plant has been enlarged by the erection of an addition, 80 x 250 ft.

M. J. Tappins, secretary Wisconsin State Board of Control, Madison, Wis., will close bids Sept. 26, at 2.30 p.m., for engines, generators, exciters, etc., on the first unit of the Southern Wisconsin Home for Feeble-Minded, Union Grove, to cost $1,000,000. The architects are Robert A. Messmer & Brother, 1004 Majestic Building, Milwaukee.

The Damrow Brothers Company Fond du Lac, Wis., manufacturer of sheet metal specialties, will build a new plant, 100 x 100 ft., two stories and basement, at Western Avenue and Brooke Street. The present factory at 35-41 Third Street is being operated on a 24-hr. schedule to fill orders.

The New England Supply Company, Providence, R. I., has definitely decided to establish a plant at Green Bay, Wis., and accepted the proposition of the Green Bay Stockyards & Packing Company to erect buildings. It is planned to build and equip a by-products plant costing from $200,000 to $250 000.

The Curtis Form-A-Tractor Company, Chicago, Ill., is negotiating with the business men's associations at Green Bay, Fond du Lac and Madison, Wis., for a location of its proposed plant and headquarters.

The Stewart-Warner Speedometer Corporation, Chicago, has practically completed the transfer of the machinery and equipment of the Warner works in South Beloit, Wis., to the recently enlarged factories in Chicago and ground was broken Sept. 1 for the new group of foundry buildings.

Pending the completion of a new assembling shop and a new motor repair shop by the Falls Motors Corporation, Sheboygan Falls, Wis., a large part of the final processes of the manufacture of gasoline motors for automobile purposes is being carried on under canvas. A huge tent has been erected on vacant property adjoining the plant so that assembling work may go on without interference of delivery schedules. The company has been able to procure 35 to 40 skilled machinists from other metal-working centers, but is in need of a great many more men.

The S. & S. Motor Car Company, 130 South Washington Street, Green Bay, Wis., has leased the ground and basement floors of the Rahr Building, and will convert it into a garage, machine shop and service station.

The Milwaukee Electric Railway & Light Company, Milwaukee, awarded the general contract for the construction of its new car repair shop, 80 x 300 ft., two stories and basement, on Oakland Avenue, near North Avenue, to the Arthur W. Riesen Company, 20 University Building. R. H. Pinkley is supervising engineer.

The South Milwaukee Garage, 1016 Madison Avenue, South Milwaukee, Wis. has sold its building and equipment to the Wright Auto Sales Company, which will purchase a small list of additional machinery during the next 30 days.

The Four Wheel Drive Tractor Company, Clintonville, Wis., is considering offers from business men's associations at Oshkosh, Shawano and other Wisconsin cities for a location for its works and headquarters. Dr. Charles Topp is president.

The Kieckhefer Box Company, Milwaukee, maker of wooden and fiber packages, has purchased the plant and entire interest of the Kaukauna Fiber Company, Kaukauna, Wis., from the receiver at $104,000. The Kaukauna plant will be operated independently of the Milwaukee factories. Some improvements will be made during the fall and winter.

The Sanitary Refrigerator Company, Fond du Lac, Wis., has awarded contract to the Immel Construction Company for its new plant, 96 x 106 ft., four stories and basement, to be ready about Oct. 15 or Nov. 1. The company recently was incorporated for $200,000 by the same interest which operates the Fond du Lac Church Furniture Company.

It is reported that the Railway Materials Company, Stevens Point, Wis., is increasing its facilities to provide for a large production of fuel oil furnaces for temperng automobile and vehicle springs and steel forgings.

The Fish Lumber Company, Elcho, Wis., is planning to build a new sawmill of the single band type, with a daily capacity of 50,000 ft. on double shifts.

Detroit

DETROIT, MICH., Sept. 4, 1916.

The Triangle Machine Company, Detroit, has been incorporated with a capitalization of $3,000 by Harry E. Kline, Albert G. Ferney and Rose Klagge Olde. It will manufacture machine and auto parts.

The Saxon Motor Car Corporation, Detroit, has purchased a factory site one block north of Michigan Avenue just outside the city limits. Plans for the new building will be announced later, according to Harry W. Ford president.

The Detroit Steam Appliance Company, Detroit, has been incorporated with a capitalization of $25,000 to manufacture steam fitting machinery and appliances. The stockholders are Charles B. Burger, Sam D. Grossman and Lawrence E. Runnels.

The directors of the Continental Motors Company have approved a plan to build a one-story, saw-tooth roof, automatic screw machine plant at Muskegon, Mich.

The Alter Motor Car Company, Plymouth, Mich., has plans for a factory building, 60 x 400 ft., to be erected at Grand Haven.

The Michigan Lumber Company, Manistee, Mich., has started work on the erection of a sawmill.

The Jackson-Church-Wilcox Company, Saginaw, Mich.,

will build an addition to its plant to practically double the capacity. The company makes the Jacox steering gear.

The Flint Springs Ice Company, Flint, Mich., will install an artificial ice plant with a capacity of approxmately 40 tons per day. It will be electrically operated.

The Calumet & Hecla Company, Calumet, Mich., has had plans prepared for a 100-ft. addition to its foundry.

Bids will shortly be asked on two electrically operated water pumps of 4,000,000-gal. capacity for the city of Menominee, Mich.

The Cadillac Auto Truck Company, Cadillac, Mich., has increased its capital stock from $100,000 to $200,000 and will erect a new building, 60 x 200 ft. W. A. Kysor is president.

Cleveland

CLEVELAND, OHIO, Sept. 4, 1916.

Machinery houses report a good volume of business in small lots and considerable new inquiry is coming out. The Pennsylvania Railroad is in the market for lathes, planers and other shop equipment for its Southwest lines. The United Furnace Company, Canton, has purchased several machine tools for its machine-shop equipment. Production has caught up to the demand in hand screw machines, of which the output has increased materially the past year, and it is claimed that some of the makers that are new in the field are quoting low prices to get the business away from their old-established competitors. The demand for automatic screw machinery continues heavy and makers report very little improvement in deliveries. There is still considerable demand from Russia for these machines. The demand for punching and shearing machinery is very heavy, particularly from shipyards. Cranes, hoists and trolleys continue in active demand.

The Torbensen Axle Company, Cleveland, has been incorporated with a capital stock of $1,750,000 to succeed the Torbensen Gear & Axle Company. It is now erecting a plant on East 152nd Street, Cleveland, for the manufacture of internal gear drive axles.

The Big Four Tire & Rubber Company, Cleveland, is reported to have purchased the plant of the Ohio Rubber Company, Berea, Ohio, which it will equip to manufacture automobile tires. G. H. Ritchie, Akron, Ohio, is president.

The White Company, Cleveland, automobile builder will enlarge its plant by the erection of a one-story steel and concrete machine shop, 241 x 304 ft.

The McLaren Iron Works Company, Cleveland, will erect a new plant at Urbana Avenue and the Nickel Plate Railroad.

The Canton Steel Foundry Company, Canton, Ohio, will enlarge its plant by the erection of an addition, 160 x 240 ft., about doubling its present capacity. The contract for the building has been placed with the Samuel Austin Company, Cleveland.

The Toledo Alloy Steels Company, Toledo, Ohio, has been incorporated with a capital stock of $75,000 by E. R. Hiett and others and plans to manufacture alloy steel. For the present the company's product will be produced by the Boecler Process Steel Company.

The Toledo Incinerator Company, Toledo, Ohio, has been incorporated with a capital stock of $10,000 by John J. Hubner, Harry E. Hubner and Carl S. Siegrist to manufacture garbage incinerators and hot water heating systems.

The American Clay Machinery Company, Bucyrus, Ohio, has purchased from the New York Blower Company the old Shunk foundry buildings and, it is stated, will enlarge them and erect some new buildings and install electric cranes, making it a modern foundry plant.

The foundry of William Cureton & Son, Lexington, Ohio, occupying a building 60 x 100 ft., was destroyed by fire a few days ago. It will be rebuilt at once.

The Alliance Rubber Company, Alliance, Ohio, has decided to reincorporate under the name of the Alliance Tire & Rubber Company and to enlarge its plant by the erection of a three story building.

Cincinnati

CINCINNATI, OHIO, Sept. 4, 1916.

From a manufacturing standpoint Cincinnati was probably less concerned over the threatened railroad strike than any other center in the country. Ohio River transportation insured a supply of coal for the larger plants and a large number of the smaller ones are operated by internal combustion engines, using natural gas. While orders for machine tools were not cut off to any appreciable extent, the mill and factory supply business was considerably reduced. Large sized lathes are hard to get for prompt shipment, and one dealer last week was unable to place an order for 20 36-in. lathes that were wanted for immediate delivery. Lately there has been a better call for shaping machines, mostly from domestic sources.

The F. H. Lawson Company, Cincinnati, will let contract in a few days for the proposed addition to its sheet metal plant in West End to cost $200,000.

The Star Motor Car Company, Cincinnati, will soon be incorporated for the purpose of erecting a plant to assemble automobiles. Louis Tyroler, Commercial Tribune Building, is one of the incorporators.

The Hausfeld Vibrator & Equipment Company, Cincinnati, has been incorporated with $10,000 capital stock by Joseph E. Hausfeld and others. It is closely identified with the Ohio Patterns Works Company and will manufacture foundry equipment. No extra machinery will be required.

The Boye & Emmes Machine Tool Company, Cincinnati, has bought an additional site adjoining its plant, but has no intention of increasing its capacity at the present time.

The Cincinnati Laundry Company, Cincinnati, will erect a large plant on Eighth Street.

The Diamond Laundry Company, Columbus, Ohio, is increasing the capacity of its plant on South Fifth Street. Nothing is known as to equipment required.

The Standard Chain Company, St. Mary's, Ohio, is reported to be contemplating increasing the capacity of its plant.

The Central South

LOUISVILLE, KY., Sept. 4, 1916.

Inquiries in all lines continue numerous. Competition is erratic in power equipment—a manufacturer citing a job on which bids varied from $6,500 to $9,000.

J. M. Holstner, Louisville, Ky., has taken over the plant and business of the Holstner & Sons Company, dissolved. J. M. Holstner will continue the sheet metal business and is installing new metal-working equipment.

The Leyman Motor Company, Louisville, Ky., operating a garage and doing a general automobile business, has incorporated with $10,000 capital. Harry L. Leyman, Cincinnati, Ohio, and Harry D. Compton and Clarence Longacre, Louisville, are the incorporators.

William Meed, Ashland, Ky., is asking for data and prices on a contractor's saw with gas engine.

The Glasgow Oil Burner Company, Glasgow, Ky., has been incorporated with $1,000 capital by H. S. Warder and L. A. Depp.

The Motor Bath Company, Glasgow, Ky., authorized to manufacture a lubricating oil, has been incorporated with $20,000 capital by Otto Summers, Cary G. Jewell and E. F. Jewell.

The Green River Chair Company, Livermore, Ky., will increase the capacity of its factory to give it 15,000 sq. ft. of floor space. C. W. Kimberlin, Owensboro, Ky., is the architect.

The Kentucky Light & Power Company, Hickman and Fulton, Ky., has purchased the plant and business of the Princeton Electric Light & Power Company, Princeton, Ky., retaining W. J. Holman as manager.

George C. Hinton, New York and Vancouver, B. C., has purchased the water franchise at Irvine, Ky., and will establish a waterworks system to serve Irvine and Ravenna, Ky.

Roach Quarles, La Center, Ky., has sold his interest in the Seaton Auto Company and with his brother will erect a garage at Heath, Ky.

N. Jensen, of the Zickgraf-Jensen Lumber Company, Jellico, Tenn., states that the company will add a hardwood furniture manufacturing factory to its band-saw and planing mills at Jellico.

The Harlan-Morris Mfg. Company, Jackson, Tenn., announces plans to rebuild the plant destroyed with a loss of $15,000. New equipment to include two 100-hp. high pressure boilers and a 125-hp. engine will be installed.

The Melick Refining Company, Lexington, Ky., has been organized with $100,000 capital stock by David L. Melick, Columbus, Ohio, and others to establish an oil refinery with a capacity of 110,000 bbl. It is stated the plant will involve an expenditure of $1,000,000.

John Janvier and Clem Finch will be in the market for some small machine tools for an automobile repair shop at Maysville, Ky.

St. Louis

ST. LOUIS, MO., Sept. 4, 1916.

While machine-tool dealers have reported some hesitancy in closing transactions under way, no other appreciable interference with demand for equipment has been noted the past week. The general inquiry continues good for equipment, for extensions as well as for new enterprises and replacements. General business conditions are reported especially good.

The Falico Chemical Company, St. Louis, Mo., has been incorporated with a capital stock of $25,000 by Guy N. Hitchcock, William Stephenson and Spencer C. Graves to manufacture coatings for metals, wood, etc.

The St. Louis Bank Equipment & Fixture Company, St. Louis, Mo., has increased its capital from $25,000 to $37,500 and will add wood-working equipment to its plant.

The Fore Electrical Mfg. Company, St. Louis, Mo., has been incorporated with a capital stock of $10,000 by Albert Wehmeier, J. H. McEwen and L. R. Brown to manufacture electrical measuring equipment and mechanical devices.

The Superior Tire & Supply Company, St. Louis, Mo., has been incorporated with a capital stock of $12,000 by Victor H. Hanschug, Theo. C. Detzer and Earl Hanschug to equip a machine shop and auto repair plant.

The Hill-Behan Lumber Company, St. Louis, Mo., has purchased a site for a new plant on which a planing mill and other manufacturing equipment will be installed to cost about $100,000.

Edward Sterns, president Efficiency Oil Corporation, St. Louis, Mo., has organized a company which will erect and equip a plant at a cost of about $250,000 for the manufacture of automobile tires and inner tubes. A daily output of 1600 casings and 3200 inner tubes will be the capacity of the first unit.

The Zink Mfg. Company, Kansas City, Mo., has been incorporated with a capital stock of $50,000 by Clarence S. and Cecil J. Zink and J. F. Cleaveland to manufacture electrical current indicators, etc.

The Bapst Motor Company, Kansas City, Mo., has been incorporated with a capital stock of $15,000 by R. E. Watson, M. S. Neal and G. M. Bapst and will equip a repair and machine shop and garage.

The Dixon Light & Power Company, Dixon, Mo., has been incorporated with a capital stock of $10,000 by George E., James B. and Anna Abernathy and will equip an electric light and power plant.

The Marion-Handley Motors Company, Kansas City, Mo., has been incorporated with a capital stock of $20,000 by L. C. Gadenhead, F. A. Britton and Glen L. Brunner and will equip a machine shop, garage and repair plant.

The Grant Motor Car Company, St. Joseph, Mo., has been incorporated with a capital stock of $15,000 by L. R. Grant, John W. Broaddus and A. L. Guitar to equip a machine shop and garage.

The Metzner Stove Repair Company, Kansas City, Mo., has been incorporated with a capital stock of $50,000 and will equip a plant to cost about $40,000 for the manufacture of stove repairs, including foundry equipment, etc.

The Economy Petroleum Company, Kansas City, Mo., C. A. Brailey in charge, will build a refinery with a daily capacity of 5000 bbl. of oil, and a pumping plant.

Jere Tyree, Kansas City, Mo., will equip a garage and repair shop requiring about $3,500 of machinery.

Hamilton, Mo., will equip a sewer system and install a disposal plant. E. T. Archer, New England Building, Kansas City, Mo., is supervising engineer. About $30,000 will be expended.

Trenton, Mo., will equip a water filtration plant at a cost of about $50,000. E. E. Harper, Trenton, is the engineer in charge.

The Searcy Oil & Ice Company, Searcy, Ark., has been incorporated with a capital stock of $50,000 by Harry Neely, Otho Kine and J. M. Shoffner and will equip a cotton oil compressing plant and an ice making plant.

The Waldron Power & Ice Company, Waldron, Ark., has been incorporated with a capital stock of $10,000 by J. S. Hill, W. S. Mitchell, W. P. Harris and J. L. Center and will equip an electric plant and an ice making plant.

The National Refining Company, Cleveland, Ohio., L. R. Bailey, Liittle Rock, Ark., manager, will equip a filling and pumping station at Little Rock, the machinery to cost about $10,000.

A contract to remove 10,000,000 yd. of earth from a coal deposit in Tulsa County, Okla., has been awarded to the Fargo Construction Company, St. James Building, Jacksonville, Fla., which is reported in the market for equipment therefor.

The Oklahoma Power & Light Company, Shawnee, Okla., has been incorporated with a capital stock of $25,000 by Edward Howell, Shawnee; J. A. Hamilton, Marissa, Ill., and Sinclair Mainland, Oshkosh, Wis., and will install equipment.

The Osage Foundry & Machine Shop Company, Bartlesville, Okla., will rebuild and re-equip its foundry recently burned. About $10,000 of machinery will be required.

The Mount-Cooper Boiler & Iron Company, Tulsa, Okla., has been incorporated with a capital stock of $50,000 by William Mount, C. A. Cooper and J. E. Waller to equip and operate a boiler plant.

The Noble County Auto Company Perry, Okla., has been incorporated with a capital stock of $12,000 by John Knox, J. C. Fleming and Lee Schurkens and will equip a machine shop and garage.

McLeod, Okla., will expend about $15,000 on waterworks plant equipment. The Benham Engineering Company, Oklahoma City, Okla., is supervising the work.

The State Capitol Commission, A. N. Leecraft, secretary, Oklahoma City, Okla., is in the market for five 250-hp. boilers for heating and power plant for the State capitol. Layton & Smith, Majestic Building, have the specifications.

The Foster Creek Lumber & Mfg. Company, Madison, Wis., will equip an electrically operated sawmill at Stephenson, Miss. A power plant with eight 18 x 84 in. high pressure boilers, two 600 kw. and one 300 kw. condensing turbines, one kw. exciter, one 25 kw. exciter motor driven water pump and about 50 motors of varied sizes will be installed.

The C. P. Foret Motor Car & Supply Company, Thibodaux, La., is in the market for one 2 hp. a.c. motor, 110 volts; also air station pump of 15 cars' capacity; drill press, lathe, battery charging outfit and other equipment.

W. T. Hopkins, Lexington Miss., is reported in the market for water turbine equipment.

William J. Lee will equip a plant at Mountain View, Ark., for the manufacture of hubs and is in the market for wood-working equipment.

Texas

AUSTIN, TEX., Sept. 2, 1916.

Irrigation projects are receiving a large amount of attention in this section, and the demand for engines and pumping equipment is unusually good. It is estimated that the Texas cotton crop will bring in a revenue of more than four hundred million dollars to the farmers.

The Gulf, Colorado & Santa Fe Railway Company, with general offices at Galveston, will construct two large water storage reservoirs and pumping plants. One will be located near Brownwood and will have a capacity of 300,000,000 gal. and the other near Sweetwater with a capacity of 290,450,000 gal.

The Willard Storage Battery Company, Dallas, has been incorporated with a capital stock of $20,000. L. Barrett is a stockholder.

A. B. Mull, Eagle, will install an irrigation pumping plant on Double Bayou.

R. Kennedy, Fort Stockton, will build a dam to impound the water of Caynosa Creek and will install an irrigation pumping plant.

W. R. Newton, Miles, plans to install an irrigation pumping plant on the Concho River, near that place.

Fritz Graef, Hovey, will install an irrigation pumping plant on Caynosa Creek.

E. W. Grimes, Bouse, Ariz., and associates, plan to install hydraulic machinery for operating the La Paz placer field. A pumping plant to cost about $125,000 will be installed and the water pumped from the Colorado River, a distance of about six miles.

The Alamo Dressed Beef Company, San Antonio, will build an addition to its packing plant to cost $34,000.

The Mogollon Power & Lumber Company, Mogollon, N. M., has awarded the contract for installing its new hydraulic plant on Mineral Creek to the Pelton Water Wheel Company.

The New State mine, near Prescott, Ariz., is to be equipped with a large air compressor and power drills. W. S. Wilhelm is manager.

John Brockman of Los Angeles, Cal., and associates will build a mill at Fierro, N. M., for the treatment of the copper-iron ores, with a daily capacity of 400 tons.

Clark W. Rider and associates, Dallas, plan to build a factory for the manufacture of express and parcel post boxes.

A new 25-hp. internal combustion engine, one double suction centrifugal pump with a capacity of 150 gal. per minute and a 70-kw. dynamo will be installed at the mu-

nicipal waterworks and the electric light plant, Vernon, Tex.

The Para Vulcanizing Company of Wichita Falls plans to establish a branch at Vernon.

The Kirby Lumber Company, Houston, has a contract with the New York Central Railroad to furnish its lines with crossties for a period of years. In order to handle the business the company will open branch offices in New Orleans, Mobile and Hattiesburg, Miss.

T. D. Brooks, Beaumont, Tex., has organized a supply company in that city, handling new and second-hand pipe, oil well machinery, drilling rigs, etc. The main wareroom is 40 x 200 ft. and will contain a machine shop.

The Pacific Northwest

PORTLAND, ORE., Aug. 29, 1916.

Machine-tool merchants are taking considerable interest in the plans for large improvements to the Puget Sound Navy Yard, Port Townsend, Wash. Current business is sufficiently active to prevent much accumulation of stock and orders are booked for future delivery. Second-hand tools are in especially strong demand. Pumps, flour mill and agricultural equipment are active. Orders for mine and smelter equipment are still coming out, and a number of plans for new industrial plants in various lines are developing. Woodworking machinery is quiet, the demand being mostly for spare parts and replacements. A strong demand for all kinds of American machinery is coming from the Orient and a much larger business would be done if cargo space were available.

The railroads are buying in fair volume. Industrial companies are expected to be in the market for more than a normal amount of lumber, but the shortage in export demand is severely felt. Unfavorable crop reports in certain districts are reflected in the lumber market. Mill operations in the West coast district continue approximately 10 per cent below normal. The car shortage in Oregon, Washington and Idaho continues to be a serious question. General business conditions are steadily improving.

The American Can Company, Seattle, has awarded a contract for the erection of the five-story reinforced concrete factory to be completed by January, 1917. The plant, including equipment and site, will represent an expenditure of more than $1,000,000.

The Acorn Lumber & Shingle Company, New Westminster, B. C., is constructing a new shingle mill at a cost of $10,000 with a capacity of 100,000 shingles daily. M. D. Irvine is president.

The Duluth Sawmill Company's plant in Harrison, Idaho, was recently destroyed by fire with a loss of $45,000. It is reported the plant will be rebuilt.

Kruse & Banks, shipbuilders, Marshfield, Ore., have the contract for the construction of a wooden vessel, 260 ft. long, 50-ft. beam, with lumber-carrying capacity of 1,250,000 ft. It will be an oil-burner, equipped with turbine engines, and will cost about $200,000.

H. D. Stewart, American Bank Building, Seattle, has received a contract from the Northern Board & Paper Company, Sumner, Wash., for the construction of an addition to cost $40,000.

The Yellowstone Packing Company, Billings, Mont., has awarded contracts for improvements and extensions to its plant to cost about $70,000.

Plans have been completed by J. F. Duthie & Co., Seattle, for their proposed shipyards, which provide for an investment of about $400,000. The plant will include a machine shop, plate shop and mold loft and will be constructed for the building of three steel freight steamers for Norwegian interests. It is announced that a contract for three more large ships has recently been received.

The Standard Tire & Rubber Mfg. Company, Kirkland, Wash., recently incorporated for $500,000, will begin work immediately on the construction of a concrete plant 60 x 120 ft. for the manufacture of rubber tires, inner tubes, etc. Max Freed is president.

The Ballard Marine Railroad Company, Seattle, shipbuilder, is reconstructing its plant at a cost of more than $150,000. It will be operated by electric power and compressed air, and will be reopened within thirty days. A new floating drydock to cost $100,000 is also to be built.

The first marine engines of the semi-Diesel type to be constructed on the Pacific coast will be built by the Puget Sound Iron & Steel Works, Tacoma, Wash., for the H. W. Sumner Company, Seattle. The contract calls for two engines, to be installed in two lumber schooners now under construction, and will cost about $40,000.

The Independent Sheet Metal Works, Seattle, has recently constructed an additional unit to its plant which will double its capacity.

S. M. and A. M. Mears are starting a plant for the construction of wooden ships adjoining the Columbia Engineering Works, Linnton, Ore.

The Pacific Coast Bolt Company, Seattle, recently organized by J. F. and A. J. O'Brien, has purchased a three-acre site and will start work at once on a factory to manufacture bolts, spikes and rivets.

The Buehner Lumber Company, North Bend, Ore., is building a new machine shop.

Sherrard & Lewellen have opened a small machine shop at Bandon, Ore.

William Leppert is putting in a small machine shop at Junction City, Ore.

Work has been started on the new Bunker Hill & Sullivan smelter, Kellogg, Idaho, to cost about $1,000,000.

Canada

TORONTO, ONT., Sept. 4, 1916.

John R. Duncan, Vulcan Iron Works, New Westminster, B. C., is trying to lease from the city a site at the foot of Tenth Street on which to establish a boiler shop and foundry and later a steel shipbuilding plant. The plan calls for an immediate investment of $150,000 and of about $200,000 more when the drydock is built. The Vulcan Iron Works has now a well-equipped plant on the water front, near the Fraser River bridge. Owing to the rapid growth of business, the company finds its present quarters cramped. The equipment planned for the new site includes plate rolls capable of handling steel plates 1 in. thick, 18 ft. wide and of any length.

H. Johnson, Port Sydney, Ont., is in the market for a 5-hp. Buffalo marine engine.

The City Council, Stratford, Ont., has unanimously agreed to accept the offer of $17,500 by the Kindel Bed Company, Toronto, for the Kemp factory at Stratford. The Kindel Bed Company will remove its machinery from the Toronto plant and install it in the old Kemp factory. P. E. Kroehler is president and general manager.

The Hanna Brothers Planing Mills, Ltd., Fort Erie, Ont., has been incorporated with a capital stock of $75,000 by Asa J. Hanna, Bridgeburg, Ont.; Fred. Hanna, Alonzo R. Ellis and others of Fort Erie, to manufacture sashes, blinds, doors, etc.

The contract for the new Dominion Arsenal at Lindsay, Ont., has been awarded to Westinghouse, Church, Kerr & Co., Inc., New York, which has a large Canadian branch at Montreal. The contract will involve probably between $2,000,000 and $3,000,000, including machinery and buildings. Colonel Weatherbee, Halifax, N. S., will supervise the carrying out the contract. It is hoped to complete the work within a few months, and to have the new arsenal turning out rifles and ammunition by spring.

It is announced that the St. Lawrence Bridge Company has commenced the installation of about $500,000 worth of machinery for the production of large caliber shells, a preliminary order for $2,000,000 having been received from the Imperial Munitions Board. Its plant is at Rockfield, Lachine, Que., and for the past few years has been concentrated upon construction work of the Quebec Bridge. The St. Lawrence Bridge Company is controlled by the Canadian Bridge Company, Walkerville, Ont., and the Dominion Bridge Company, Montreal, each company owning 50 per cent of the capital stock.

The sawmill at Chicoutimi, Que., owned by A. Gagnon, was destroyed by fire with a loss of $40,000. The plant will be rebuilt as soon as possible.

The Iron & Metal Supply Company, 400 Power Building, Montreal, will build a factory at Sherbrooke, Que., at a cost of $15,000.

The Canadian Clock Company, Orangeville, Ont., proposes to build a factory at a cost of $30,000. It is asking the town for a loan of $15,000 and a by-law will be submitted to the ratepayers.

The Dominion Hardwoods, Ltd., Deseronton, Ont., will build a concrete and steel factory at a cost of $150,000 to replace its plant recently destroyed by fire.

The Manufacturers' Corundum Company, Jewelville, Ont., has commenced the erection of a plant. H. E. T. Haultain, 63 Heath Street West, Toronto, is the engineer in charge.

The Marsh Hutton Powers Company, Western Trust Block, New Westminster, B. C., has leased a site on Lulu Island and will build a shingle mill to cost $30,000. Construction work will be commenced in the near future.

The National Mfg. Company, Ottawa, manufacturer of steel ranges, scales, etc., will build an addition to its factory to cost $16,000.

The George White & Sons Company, Ltd., Cabell Avenue, London, Ont., manufacturer of threshing engines, boilers, machinery, etc., is having plans prepared for a factory addition on Adelaide Street to cost $15,000.

Frank A. Robinson's flour mill at Grenville, Ont., was damaged by fire with a loss of $6,000. It will be reconstructed and new machinery installed.

The Experimental Farm, Fredericton, N. B., will have a new pumping plant erected to cost $3,000. Judson Barker will be foreman of construction.

Ottawa will receive tenders until Sept. 8 for one portable gasoline-driven air compressor, 100-cu. ft. capacity; four pneumatic calking hammers, and two 5-ton chain blocks. Specifications may be obtained from A. F. Macallum, commissioner of works.

H. M. Rathbun, Deseronto, Ont., is in the market for an 80 to 100 hp. locomotive-type, 100 lb. pressure.

The Canadian Steel Foundries, Ltd., Welland, Ont., has purchased a site adjoining its plant to be used for future additions.

Henry Schaake, Schaake Machine Works, New Westminster, B. C., will establish a machine shop and foundry on the water front. A ship repair plant is also contemplated.

The Saskatchewan Steel & Bridge Company, with plants at Moose Jaw, Sask., and Medicine Hat, Alberta, is planning to establish a plant at New Westminster, B. C.

The Cushman Motor Works of Canada, Ltd., Winnipeg, has been incorporated with a capital stock of $100,000 by Albert E. Donovan, Frank K. Hamilton, Harvey E. Kennedy and others to manufacture farm implements, motors, machinery, engines, tools, etc.

The Manitoba Steel Foundries, Ltd., Montreal, has been incorporated with a capital stock of $300,000 by Peter J. Smith, Arthur M. Tirbutt, Horace Ormond and others, all of Winnipeg, to manufacture tools, machinery, etc.

The Mitchell Rail Anchor & Specialty Company, Ltd., Montreal, has been incorporated with a capital stock of $30,000 by Louis A. David, Joseph S. Lamarre, Sigfried H. R. Bush and others to manufacture railroad track material, cars, tools, implements, machinery, boilers, etc.

The National Bronze, Iron & Engineering Works, Ltd., Montreal, has been incorporated with a capital stock of $750,000 by Louis A. David, Benjamin Robinson, Joseph S. Lamarre and others to manufacture machinery, munitions, tools, implements, etc.

The Lakeport Elevator Company, Ltd., Fort William, Ont., has been incorporated with a capital stock of $40,000 by Frederick A. Guy, Daniel R. Byers, Leslie J. Greaves and others to build equip and operate elevators, warehouses, etc.

The Canadian Export Paper Company, Ltd., Montreal, has been incorporated with a capital stock of $500,000 by Walter R. L. Shanks, Francis G. Bush, George R. Drennan and others to manufacture paper, etc.

The Montreal Machinery & Supplies, Ltd., Montreal, has been incorporated with a capital stock of $50,000 by Francis G. Bush, Walter R. L. Shanks, Michael J. O'Brien and others to manufacture machinery, supplies, tools, etc.

W. E. Clark, Ltd., Toronto, has been incorporated with a capital stock of $40,000 by Wilbert E. Clark, 28 Adelaide Street West; James F. Coughlin, 8 Beatrice Street, Francis P. O'Hearn and others to manufacture brass, steel, iron and metal products, etc.

Two contracts for equipment for handling shell forgings, totaling over 4½ miles of roller conveyors and carriers, have been placed with the Mathews Gravity Carrier Company, Ellwood City, Pa. One order is for 9000 ft. of 8-in. roller carrier for the E. W. Bliss Company, Brooklyn, N. Y., while the other is for 15,000 ft., which will be installed at the Richmond, Va., plant of the American Locomotive Company to handle the forgings from the time they are received in cars until they are shipped. Several automatic inclined elevators are included in the latter order.

The Farnsworth Mfg. Company, 65 Beverly Street, Boston, Mass., manufacturer of steam utilities (tilting traps and duplex boiler feeders), has opened a Chicago office at 20 East Jackson Boulevard. Charles O. Lindahl has been engaged as managing district engineer. The Farnsworth line is comparatively new, but strong claims are made as to coal economy by handling condensation through its system.

Book Reviews

Homans's Automobile Handbook. By J. E. Homans. Pages, 248, 5 x 7½ in.; illustration, 77. Published by Scully & Kleinteich, 373 Fourth Avenue, New York City. Price, $1.

The book summarizes in a volume of moderate size the principles of construction and operation of a gasoline motor car and engine. A full description of the essential parts and auxiliaries is given with directions for the management, operation and care of the car, the explanations being notably lucid. The transmission apparatus is discussed at some length with reference to the various types, such as chain, bevel and worm gear, friction disk and magnetic transmissions, and the various types of speed changers in use. The engine, of the several forms used, is gone into at length, and the subjects of fuel, ignition and lubrication all receive attention.

For the motor-car owner who would like to have ready means for keeping a record of the automobile expenses and at the same time secure some bits of advice relating to motor-car operation, the Norman W. Henley Publishing Company, 132 Nassau Street, New York, has brought out what it calls the "Automobilists' Pocket Companion and Expense Record." Its author is Victor W. Pagé, who has written several other books on the automobile, and its price is $1. Most of its 169 pages, which are bound in flexible covers, are blank forms for all imaginable collations of expense and tour figures. Lest he forget, the motorist is told what to do every day the car is in use in the matter of lubrication for example, and he is told how to care for the storage battery and the tires. There are several pages of symptoms of road troubles and to what they point. How to keep the hands soft is listed first under "Useful Information," which tells however also how to care for the tops and the upholstery. A few tables of interest are appended.

The American-Russian Chamber of Commerce, 60 Broadway, New York, has issued a bulletin, "The Russian Market, Its Possibilities and Problems." The point is emphasized that "to secure a permanent foothold in the Russian market it is essential that many American firms should create companies in Russia for the purpose of developing Russian business enterprise, and a knowledge of Russian incorporation law is necessary." Special attention is devoted in this booklet, therefore, to the methods of establishing incorporations in Russia, and it is shown that there has been a remarkable development in the joint stock companies operating in Russian business. The Russian Minister of Commerce recently said publicly: "We will, as far as possible, welcome foreign capital necessary for our development."

A 56-page pamphlet illustrating and describing the various pieces of apparatus employed for welding and cutting by the oxy-acetylene and oxy-hydrogen processes, has been issued by the Imperial Brass Mfg. Company, 1210 West Harrison Street, Chicago. The pamphlet, which is intended for use as a handbook, is free from technicalities, although the fundamental principles are not slighted. Suggestions for beginners are given, together with instructions on the care and use of the apparatus. Numerous engravings of the apparatus, and the way in which the various operations should be performed, are presented in the pamphlet, which is of the 6 x 9-in. size. The price is $1.

The water powers of Canada have been made the subject of a publication obtainable from the Department of the Interior, Ottawa, Canada. The book has some 360 pages, profusely illustrated. It is a reprint in combined form of five monographs by several Canadian water-power engineers, prepared originally in connection with the International Engineering Congress at San Francisco last September.

In the review of "Poor's Manual of Public Utilities" in THE IRON AGE of July 27 it was stated that the price is $7.50. It should have been given as $10.

TRACTORS HANDLE PIG IRON

Electrically Propelled Truck Used in Ferro Machine & Foundry Plant

BY F. L. PRENTISS

The problem of providing a satisfactory and economical method of handling material in the process of manufacture has been solved by the use of electric tractors and trucks in many plants, but the Ferro Machine & Foundry Company, Cleveland, is said to be the first to use an electric tractor for handling pig iron and other material used in its cupolas, flasks and castings. In addition it is used for taking scrap from the foundry floor and cleaning room, for conveying steel stock from the storage yard to machine shop, and, in fact, does practically all the handling work required around the foundry and adjoining yard with the exception of conveying the hot metal from the cupolas to the foundry floor.

An Electric Tractor and Three of the Specially Designed Trailer Trucks Employed by the Ferro Machine & Foundry Company to Handle Pig Iron. A Boardwalk Has Been Laid in the Storage Yard to Serve as a Track for the Tractor

The Ferro Company has used an electric tractor in its foundry for several months, and it is stated that its use has been found to have resulted in a great saving in labor. The adoption of the tractor conveying method was suggested by the large amount of labor required in conveying castings from the foundry floor to the cleaning department. Before the tractor was provided it often required a dozen men to push a truck heavily loaded with castings from the foundry to the cleaning room, the unevenness of the brick foundry floor and the sand that necessarily accumulates on the floor making the propulsion of the loaded truck by hand power extremely difficult. The results at this plant are stated to have proved that an electric tractor can be very successfully operated when plant conditions make it necessary to run it over a rough track caused by a badly worn and uneven floor.

The volume of work done by the tractor is indicated by the fact that it hauls from the material storage yard all the pig iron, scrap and coke used in the cupolas that melt 110 tons of metal a day, conveys the castings weighing approximately the same amount from the foundry floor to the cleaning room and the metal flasks between the foundry and outside storage yard, in addition to various other conveying services. The tractor is kept in operation almost continually, or about 20 hr. per day. The distance of the hauls ranges from 200 to 400 ft.

The company has just placed in use 25 trucks or trailers of a special type to increase the value of its tractor conveyor system. These are scattered around the foundry and yard as needed and when loaded are hauled to their destination. The tractor has a capacity of hauling three or four trailers, but in operation usually draws but one or two trucks. About 3 tons of pig iron is placed on each truck for a load.

To provide a good track for the tractor and trucks outside of the plant board walks were laid throughout the storage yard, these walks crossing the railroad siding in the yard, in which pig iron and other material is stored. A locomotive crane and magnet is used for unloading the pig metal from the cars. There is about 400 ft. of board walk, 8 ft. in width and constructed to withstand the heavy loads of the tractor. The walk is built of 6 x 6-in. pine laid on 2-ft. centers covered with 2 x 10-in. pine plank, and on the latter 3 x 10-in. oak plank is laid at an angle of 45 deg. A new 6-ton Otis electric elevator with a cage 7 ft. 6 in. x 8 ft. 2 in. has just been installed for conveying pig iron to the cupola platform. The tractor goes up to the elevator with its load, which it hauls out on the platform.

The tractor is of a standard type built by the Elwell-Parker Electric Company, Cleveland. It is mounted on four 15-in. wheels, being steered by all four wheels and driven by the two rear ones. The drive is from the motor mounted under the dash through worm gearing to the rear axle. It has three speeds in either direction and its pulling capacity is 400 lb. The maximum speed is 6½ miles per hour. Two Edison 21-cell batteries furnish the electric power for the tractor. The batteries are given four boosting charges for ½ to 1 hr. per day at double the normal charging rate or 90 amp., which is equivalent to a normal charge of 7 hr. On Sundays a normal charge of 45 amp. is given for 7 hr. Extra sets of batteries are provided for use should it be necessary for any reason to remove the regular batteries. Because of the additional work for the tractor, a duplicate of the one now in use has been ordered. Both tractors will be equipped with a new type of Elwell-Parker automatic coupler.

The company places the cost of operating the tractor at $1.15 per hour, but states that this estimate is rather high. This cost includes the pay for the operator and helper, charging the batteries, 50c. a day charged for repairs and 25 per cent. per annum for depreciation.

The trailers or trucks are of very heavy and strong construction, being designed for heavy foundry service. They are 6 ft. long and 36 in. wide. They have 5-in. channel frames and cross supports

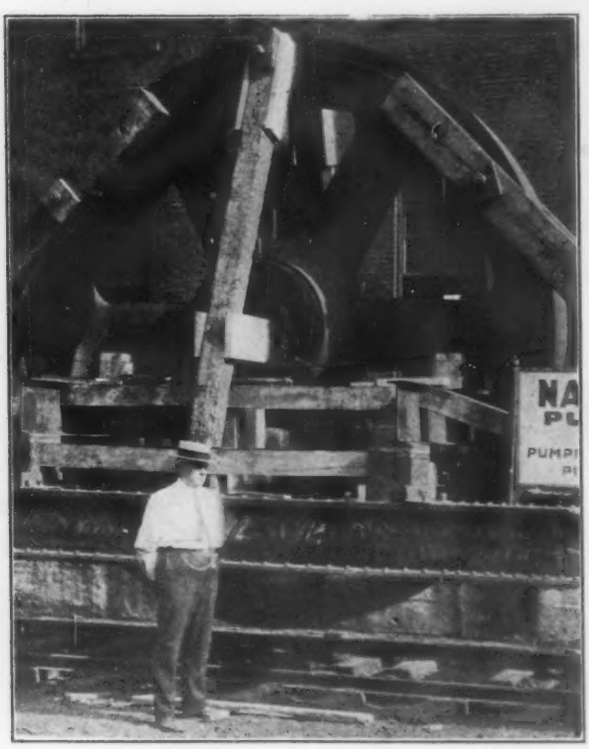
and 3/16-in. plate platforms. Near the edge of the platform on both ends and sides are holes for 1-in. pipe for stakes. These stakes are supported underneath by pressed steel stockets riveted to the frame and located underneath each hole. The trucks run on two center wheels 18 in. in diameter located underneath the frame, so that the body of the truck is entirely clear at the sides, eliminating the danger of the wheels striking obstacles. At each end are two caster wheels 10 in. in diameter. This construction permits the trucks to run on the two center wheels and to teeter on the caster wheels. Both the center and the caster wheels are unusually wide, having a 4-in. face. The trucks were designed with large wide wheels and caster wheels at each end with a view of making them well adapted for running on uneven ground and over sand on the foundry floor. The wheels have cage roller bearings. The trucks were built by the Lakewood Engineering Company, Cleveland.

The company will shortly begin hauling foundry refuse with a tractor and trucks. This refuse is now removed with a locomotive crane at a daily cost of $40, and it is estimated that with the tractor the daily cost will be reduced to $12. It amounts to about 3500 cu. ft. per day and has to be hauled to the dump, a distance of from 700 to 1000 ft.

The Ferro Company has adopted a standard wood floor for its manufacturing departments, including the foundry. The use of a wood floor in a foundry is an innovation, as the general objection might be made to it that the surface would be burned by hot metal spilled upon it, and consequently it would not be lasting. However, it is the intention to replace the present brick foundry floors with wood. The standard creosoted wood block floor adopted is made of 3 x 6-in. pine blocks 3 in. thick, saturated with 20 lb. of oil per cubic foot.

Shipping a 75-Ton Flywheel

The National Transit Pump & Machine Company, Oil City, Pa., recently shipped a very large casting—a 14-ft. flywheel forming part of the drive for a 300-ton billet mill being installed by the Crucible Steel Company of America in its plant at Midland, Pa.



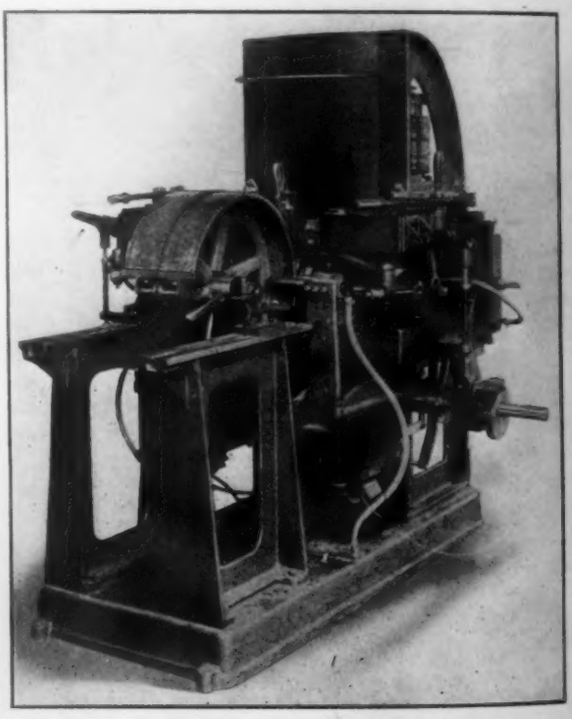
The Center of a 14-Ft. Flywheel Forming Part of the Drive for 300-Ton Billet Mill Ready for Shipment

The shipment was loaded on three special steel cars of the well type that has been developed by the Pennsylvania Railroad for transporting pieces of machinery that are too high for the ordinary type of flat car. One car was used for the center of the flywheel, which was supported by steel beams and heavy timbers, as shown. The two rings, which are to be bolted on either side of the rim of the center section, were placed in another car and supported in practically the same manner. The clearance between the under side of the flywheel and the rails was 8 in., and the top escaped the tunnel roofs and bridges along the line by 4 in. The shaft and the bearings which weighed approximately 30 tons were contained in the third car. The two end rings of the flywheel also weighed 30 tons and the weight of the completed wheel was approximately 75 tons.

The casting was made by the loam mold method with green sand. Approximately 200 tons of sand was required to make the mold.

Electric Welding of Pulleys

Another special machine has been developed by the National Electric Welder Company, Warren, Ohio. It is designed for welding pulley fillers to rims ranging from 12 to 60 in. in diameter. Apart from the great



An Automatic Machine for Welding Pulley Spokes to Rims by Electricity

range of automatic operation, the machine is characterized by a small number of moving parts, simplicity of operation and the provision of complete and separate welding equipment on each side of the pulley center.

Water cooling is provided for the welding points, which can be withdrawn to give a clearance of 12 in. between them. If desired they can be arranged to operate within a radius of 2½ in. from the center of the arbor. The feeding and the stopping of the work are automatic, the feed device being adjustable from ⅛ to 3 in. between welds as desired. The stops operate automatically to trip the machine. The desired distances between centers and the face of the work are secured by an adjustable mandrel.

Motor drive and an automatic switch are provided for each of the welding equipments which have a capacity of 60 welds per minute each. The floor space occupied by the machine measures 50 x 66 in. and the weight of the machine is approximately 3500 lb.